US006992897B2

(12) **United States Patent**
Shimada et al.

(10) **Patent No.: US 6,992,897 B2**
(45) **Date of Patent: Jan. 31, 2006**

(54) **ELECTRONIC APPARATUS AND INFORMATION PROCESSING APPARATUS**

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(73) Assignee: **Canon Kabushiki Kaisha**, (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/636,911**

(22) Filed: **Aug. 7, 2003**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Aug. 9, 2002 (JP) 2002-233118

(51) **Int. Cl.**
H05K 5/00 (2006.01)

(52) **U.S. Cl.** **361/726**; 361/685; 312/223.1; 312/223.2; 439/162

(58) **Field of Classification Search** 361/683–686, 361/724–734, 740, 752, 754, 759; 710/303, 710/304; 312/223.1, 223.2, 332.1, 333; 439/152–160
See application file for complete search history.

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Assistant Examiner—Anthony Q. Edwards
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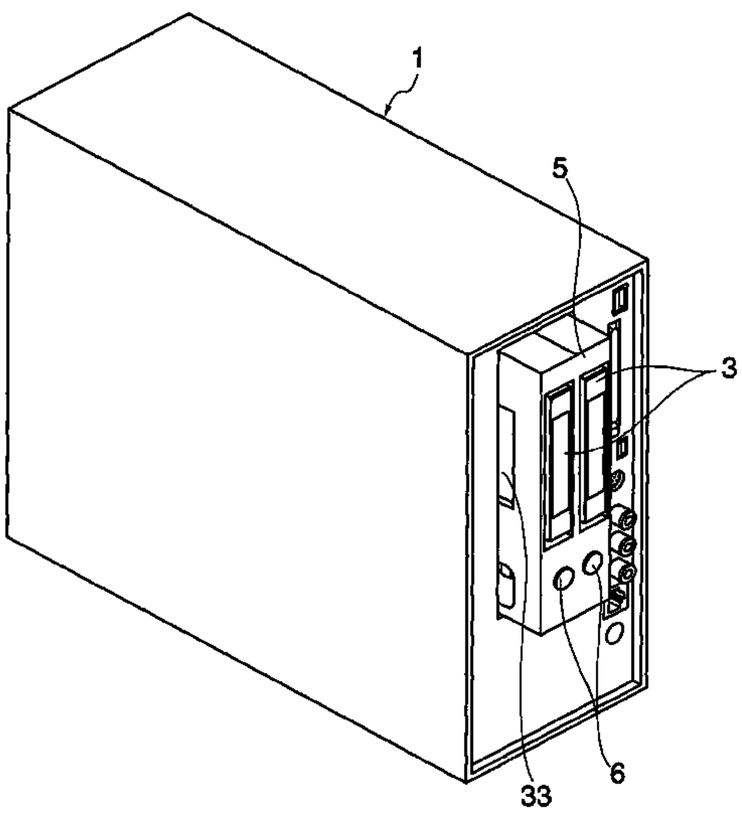
(57) **ABSTRACT**

There is provided an electronic apparatus that can solve the problem with the prior art that a removable electronic device is removed while the removable electronic device is in operation, leading to unfavorable results. A disk unit is removably attached to the main body of the electronic apparatus and receives at least one removable hard disk as a removable electronic device removably attached thereto. A locking mechanism locks together the disk unit and the main body. A CPU controls the locking mechanism to inhibit the disk unit and the main body from being locked together while the removable hard disk is in operation.

16 Claims, 44 Drawing Sheets



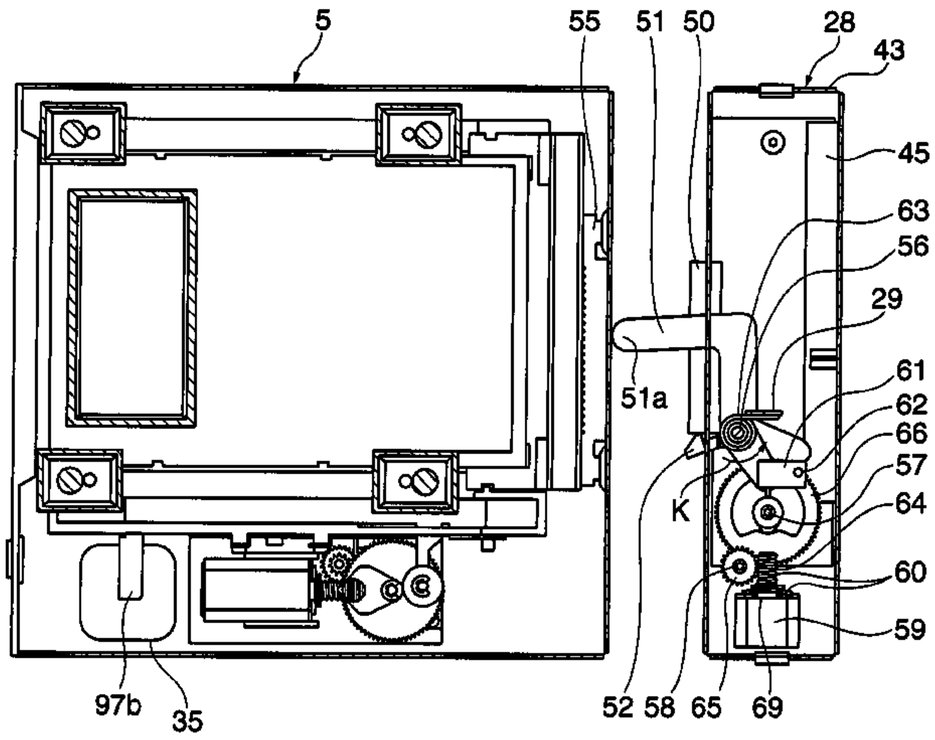


FIG. 1

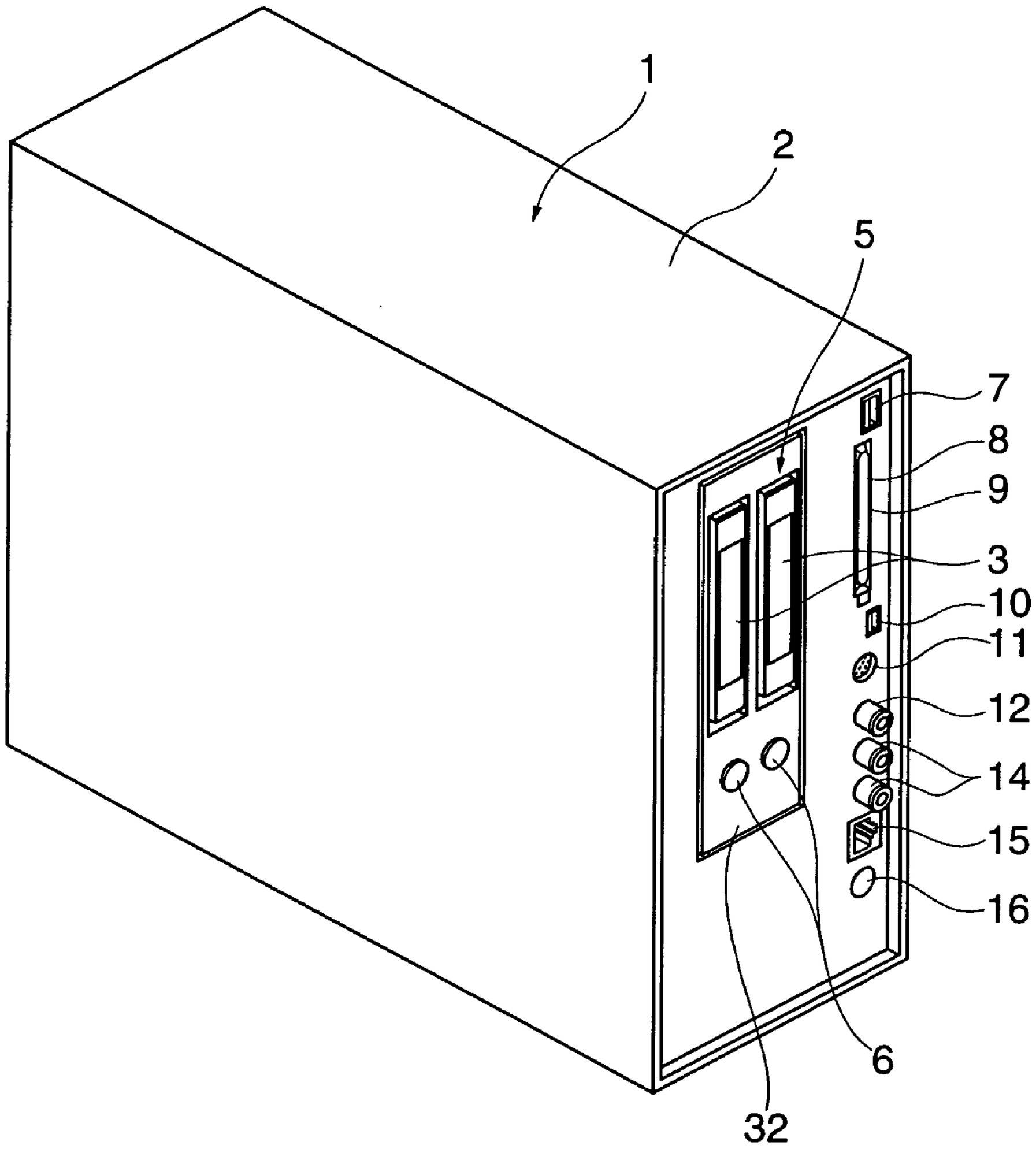


FIG. 2

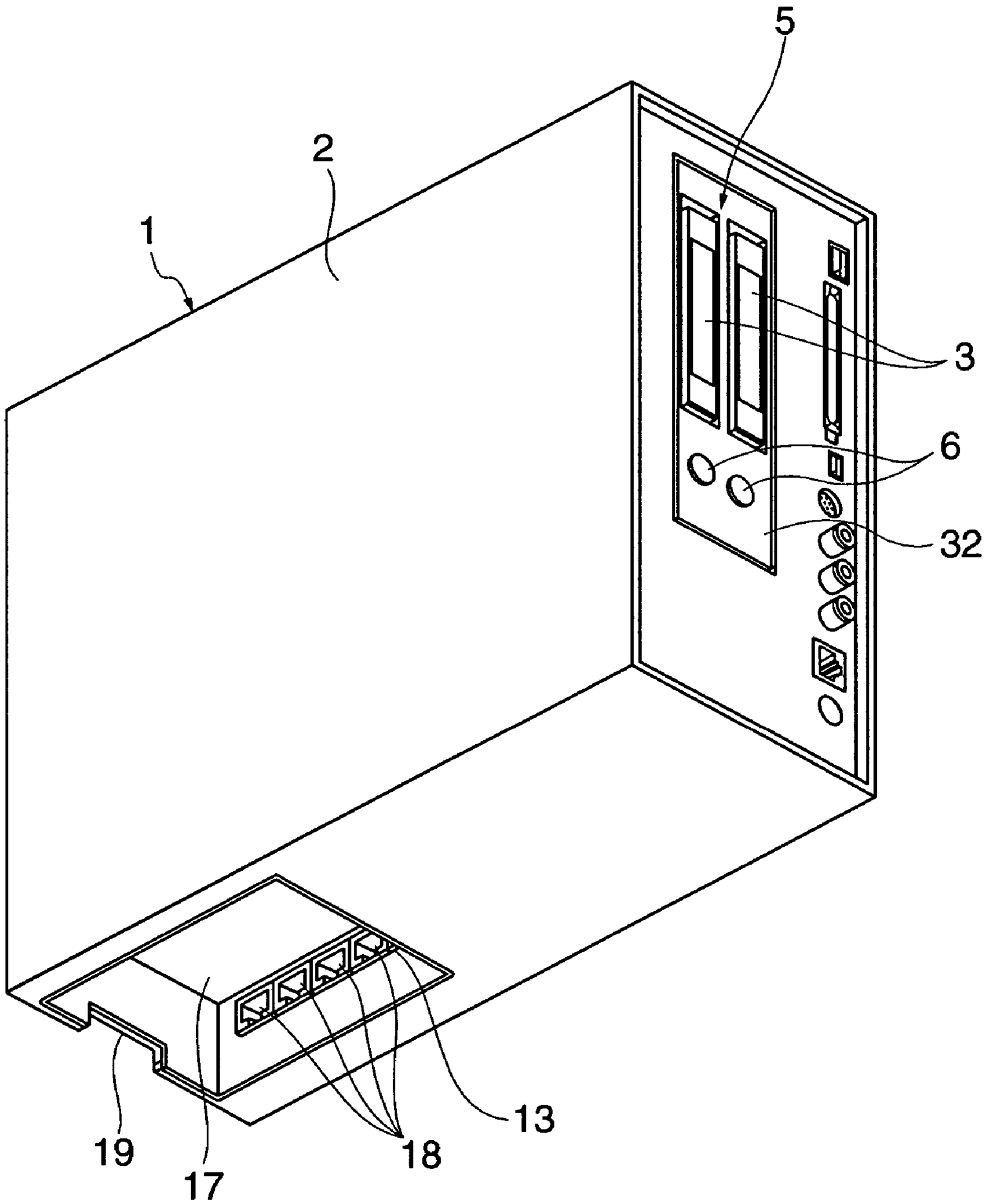


FIG. 3

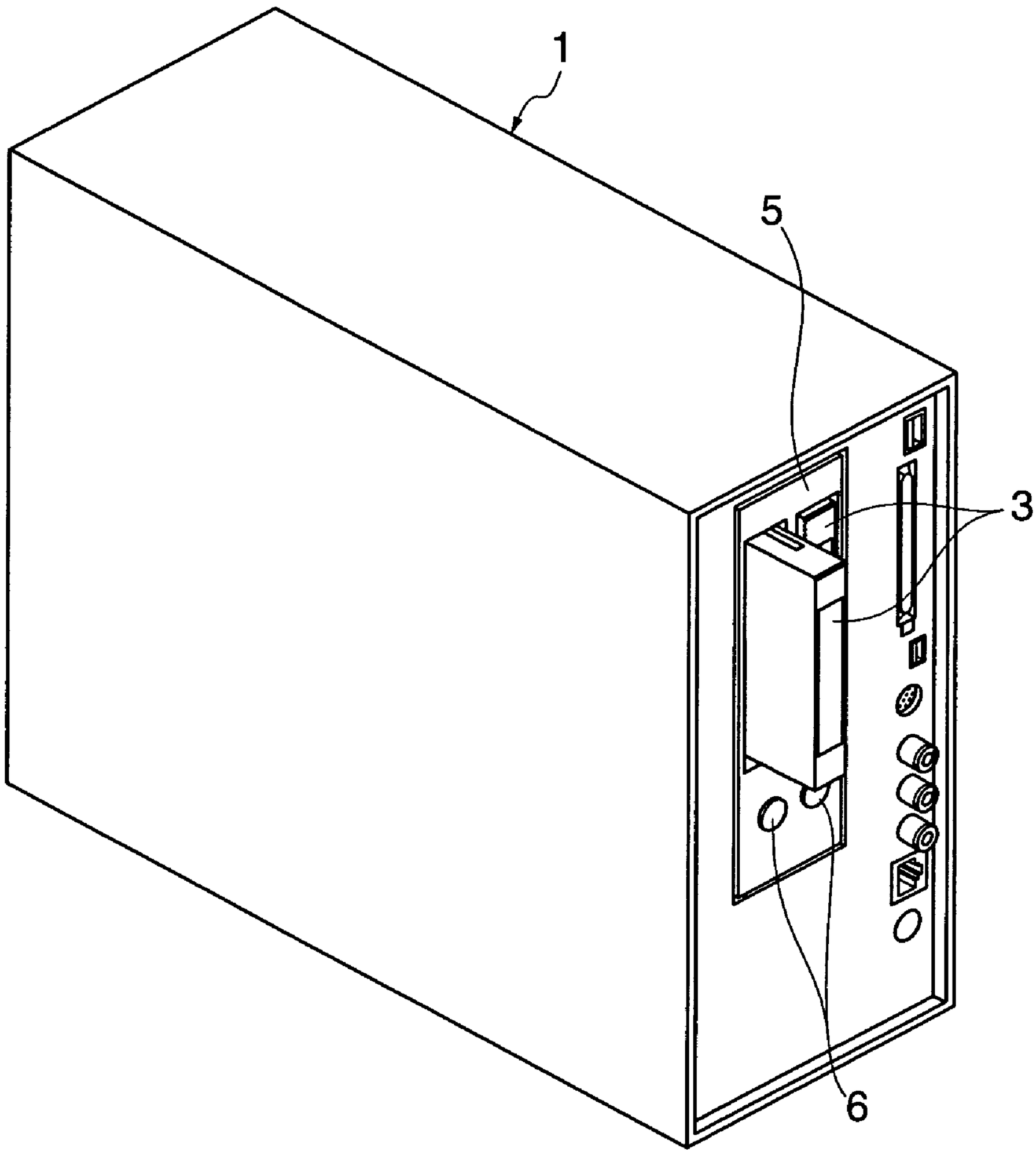


FIG. 4

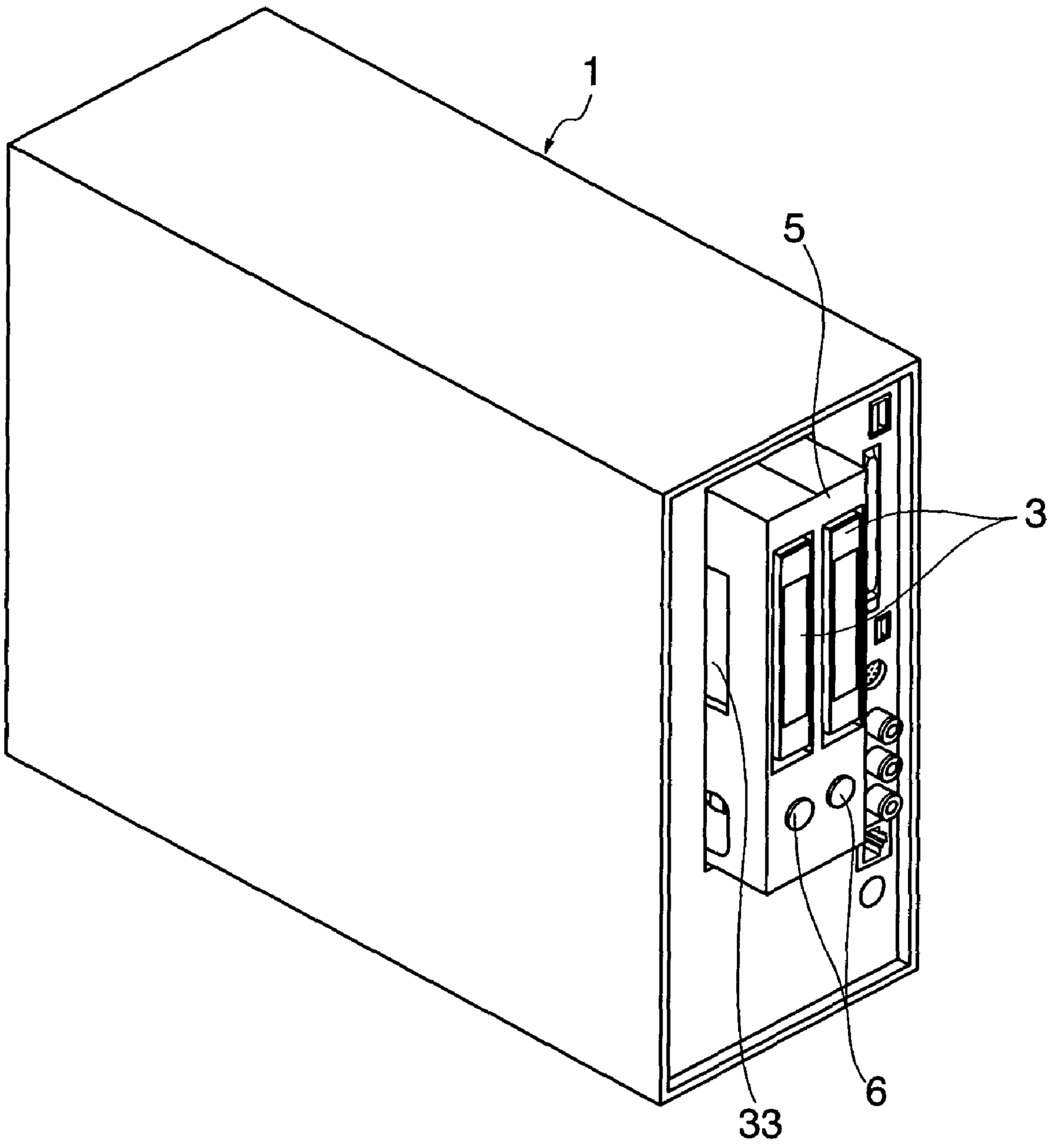


FIG. 5

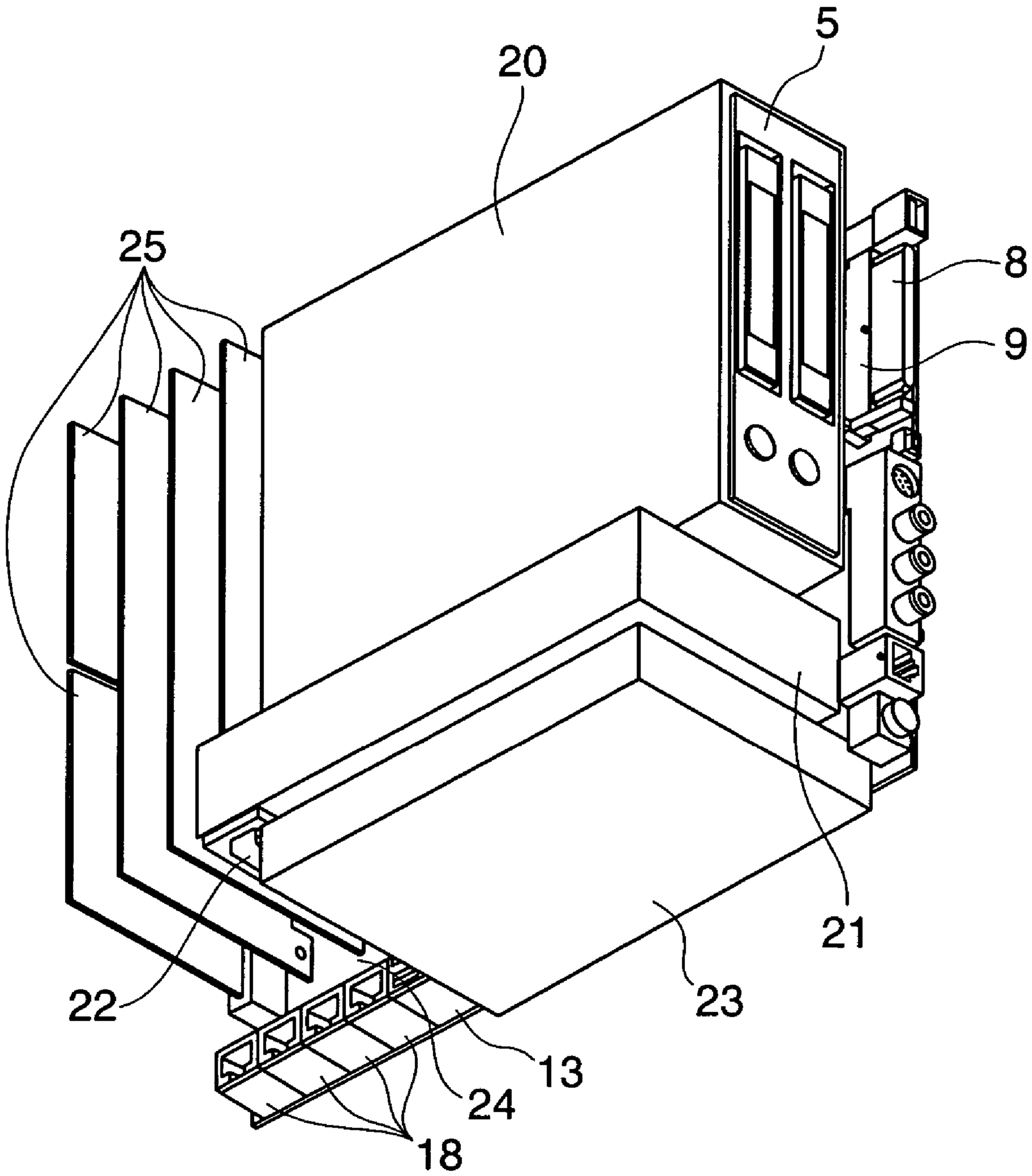
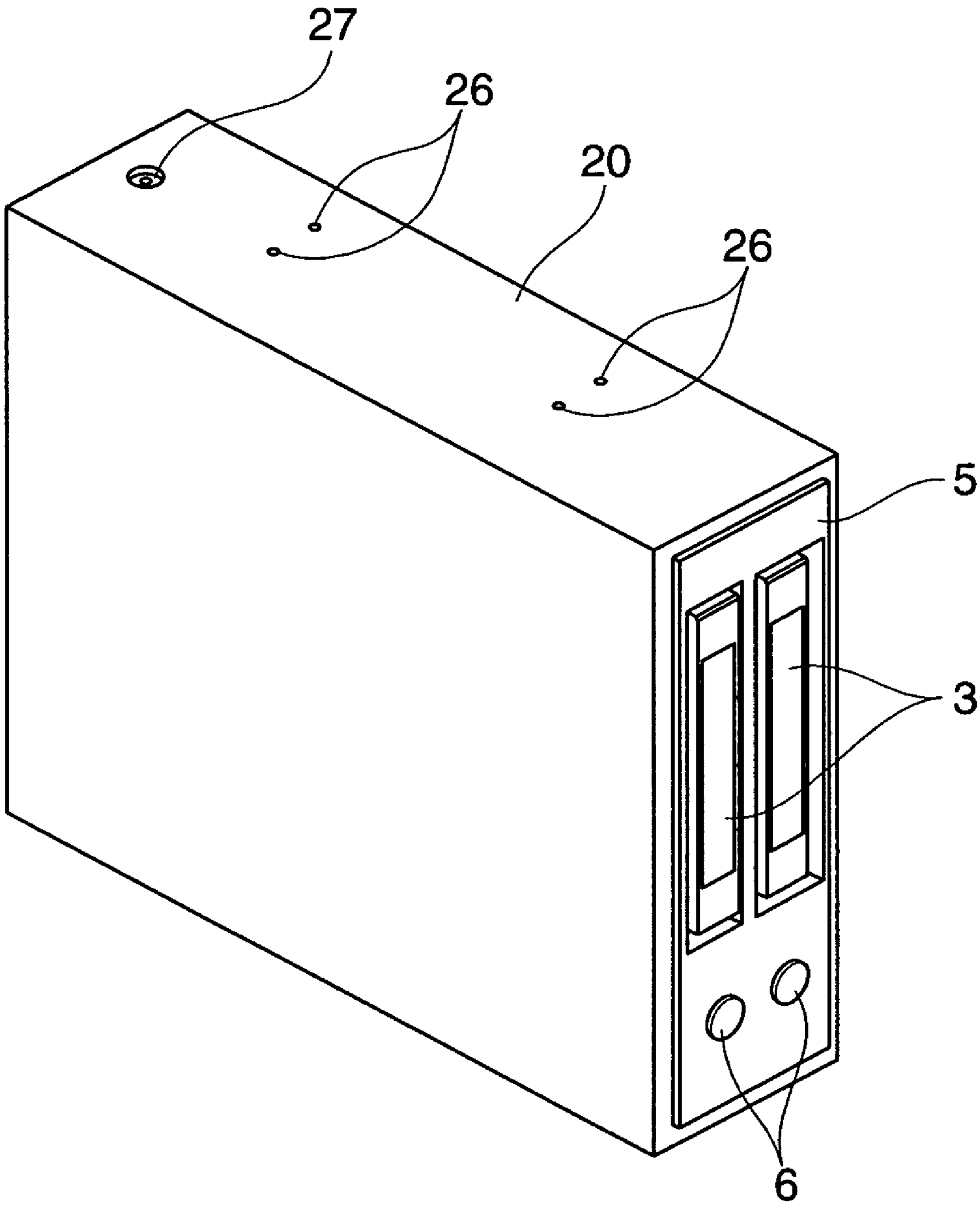


FIG. 6



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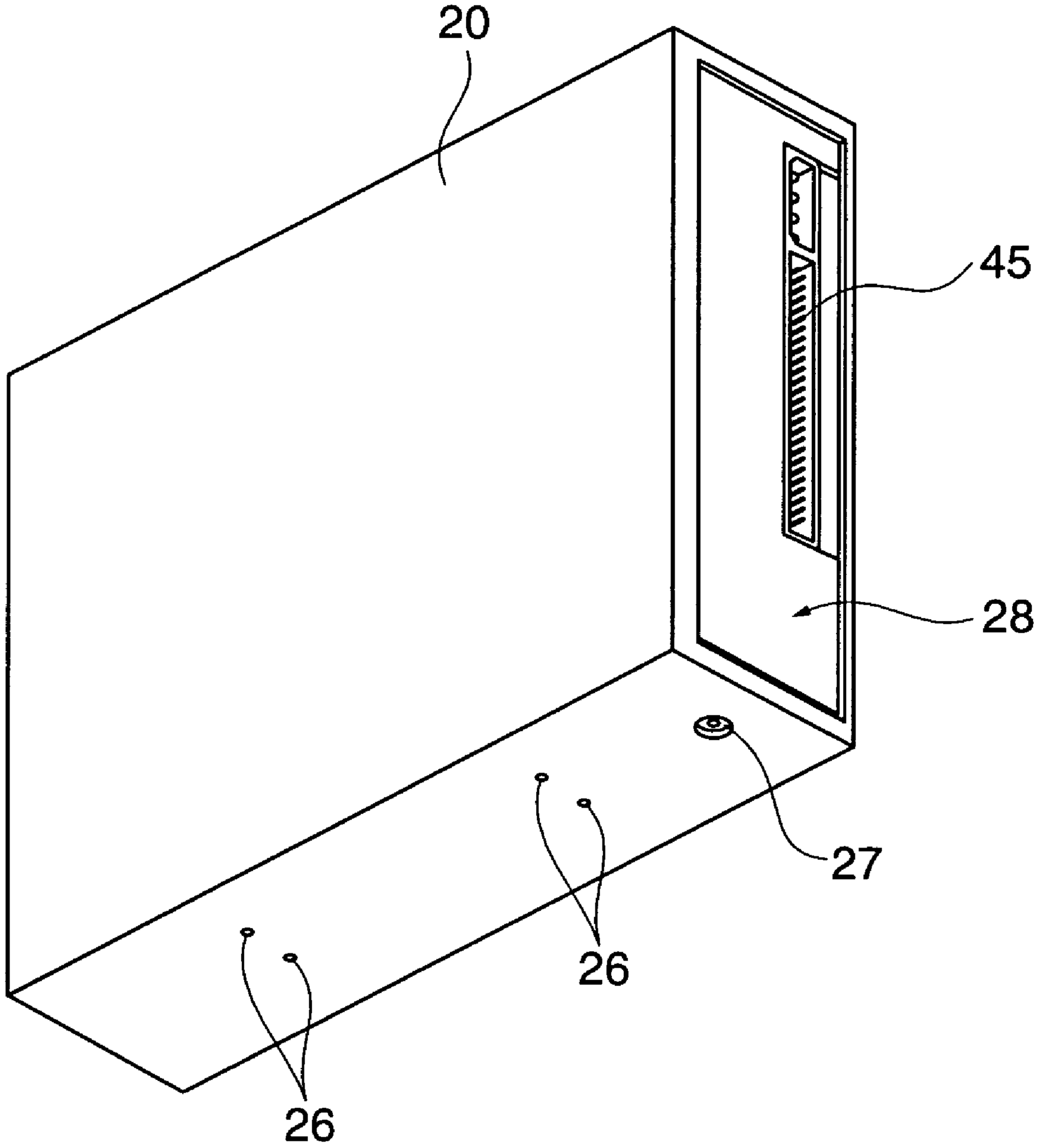
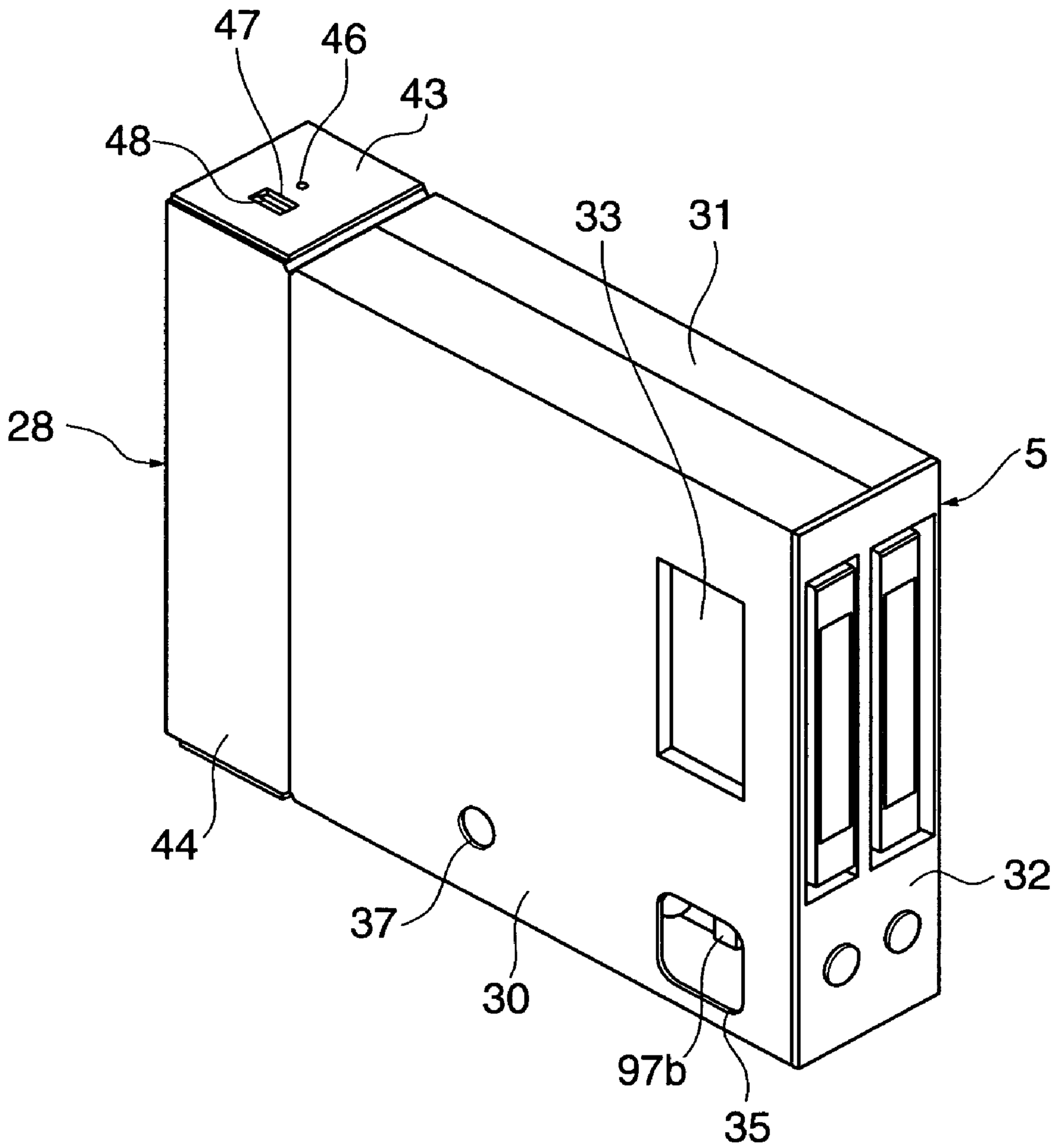


FIG. 8



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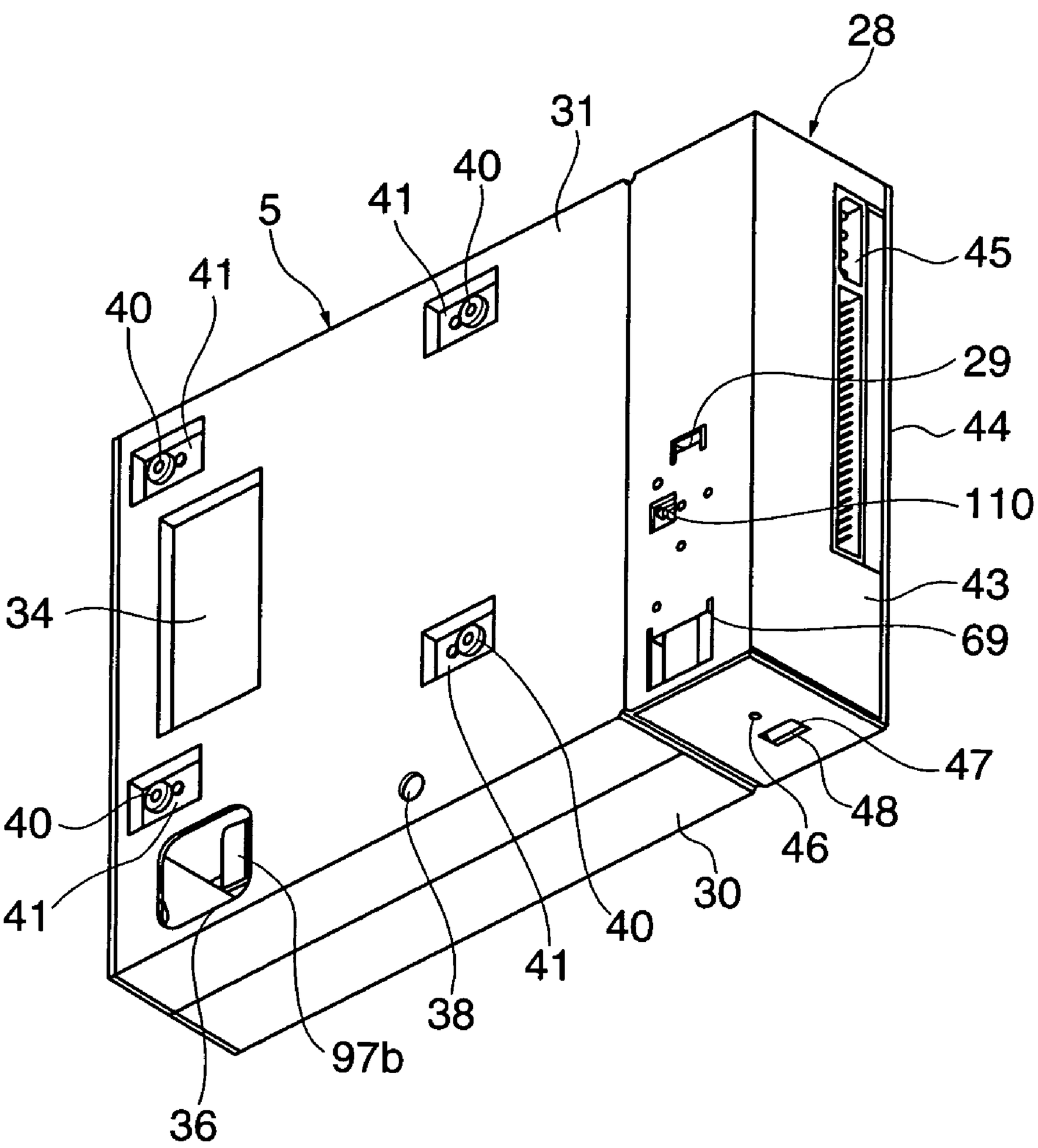
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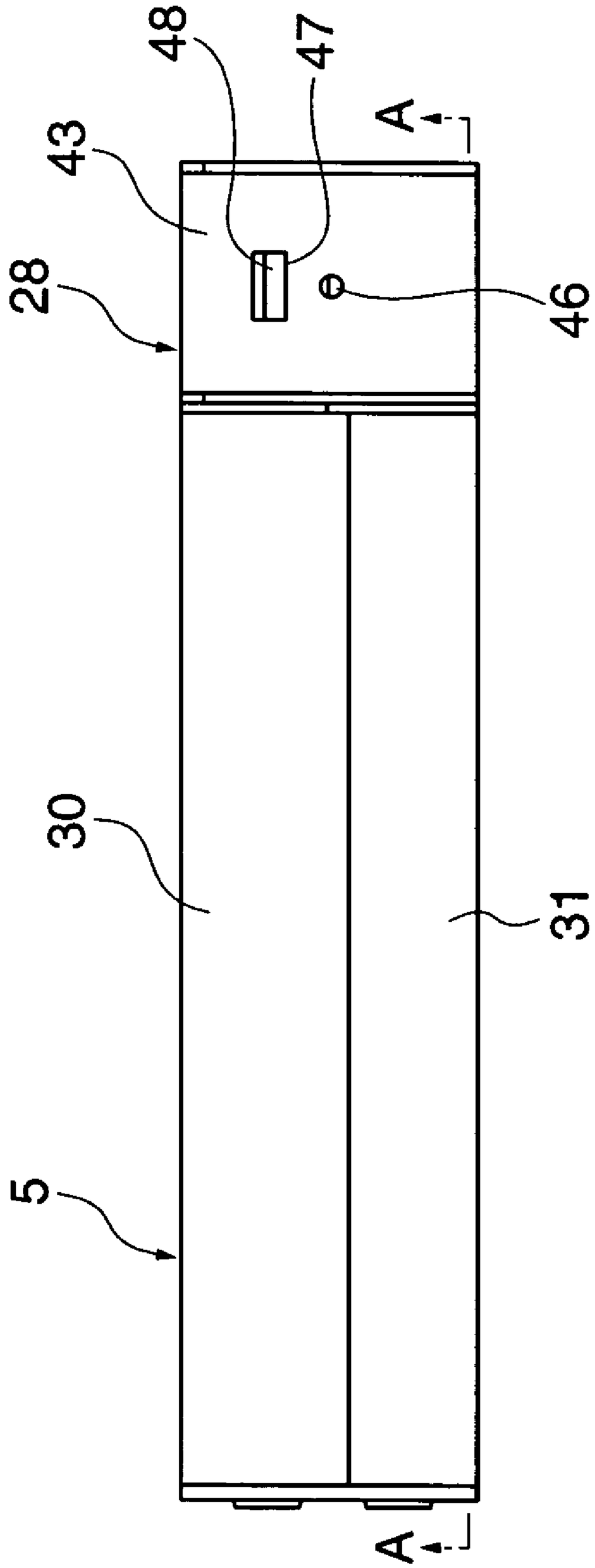

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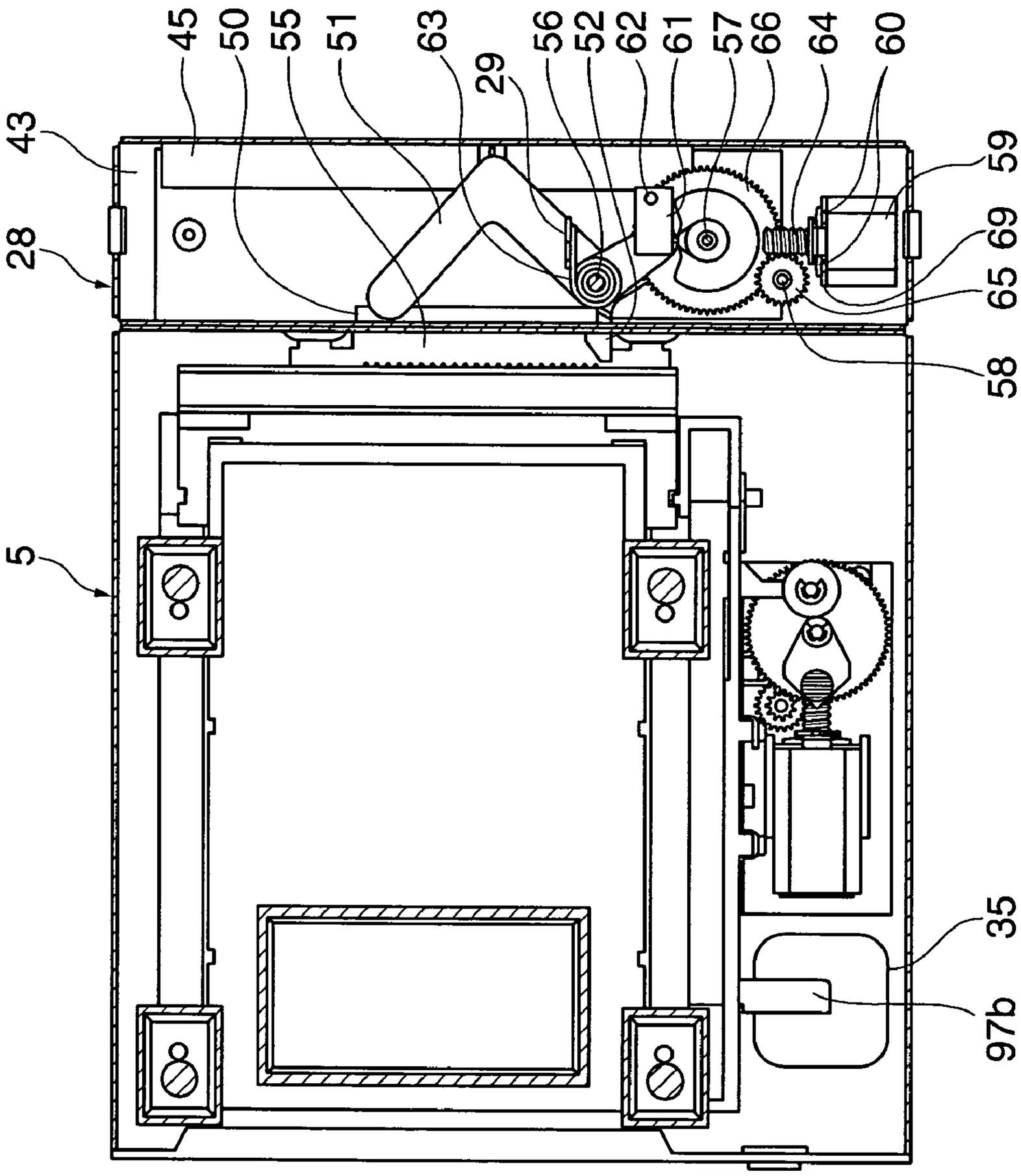

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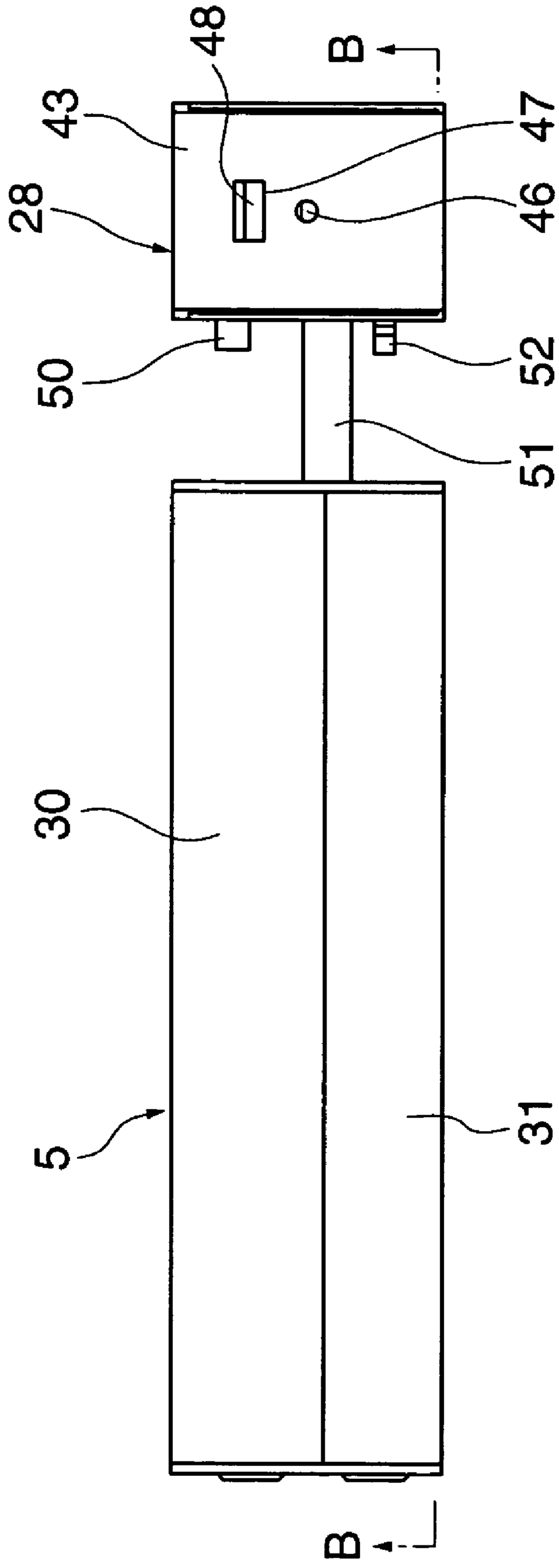

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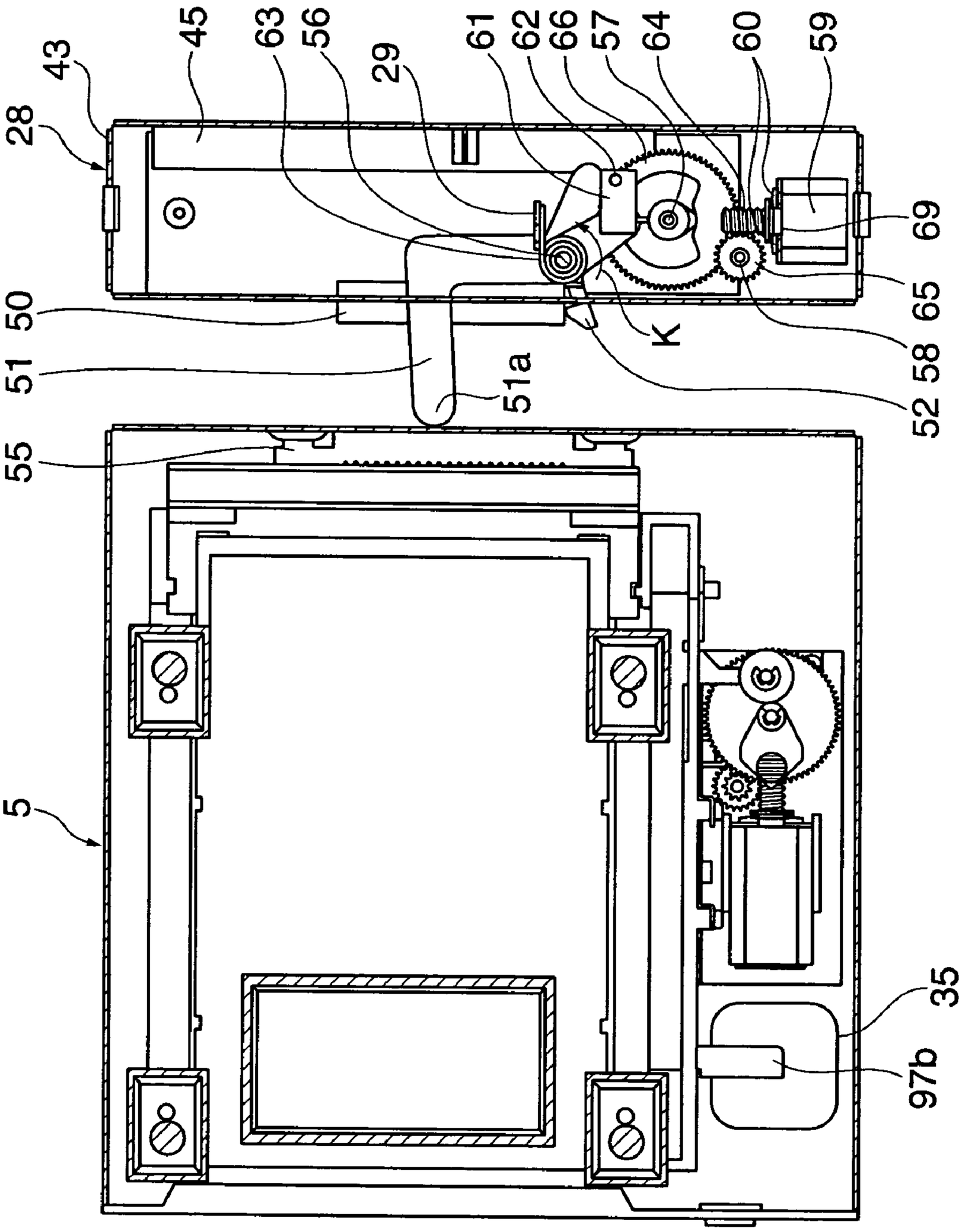
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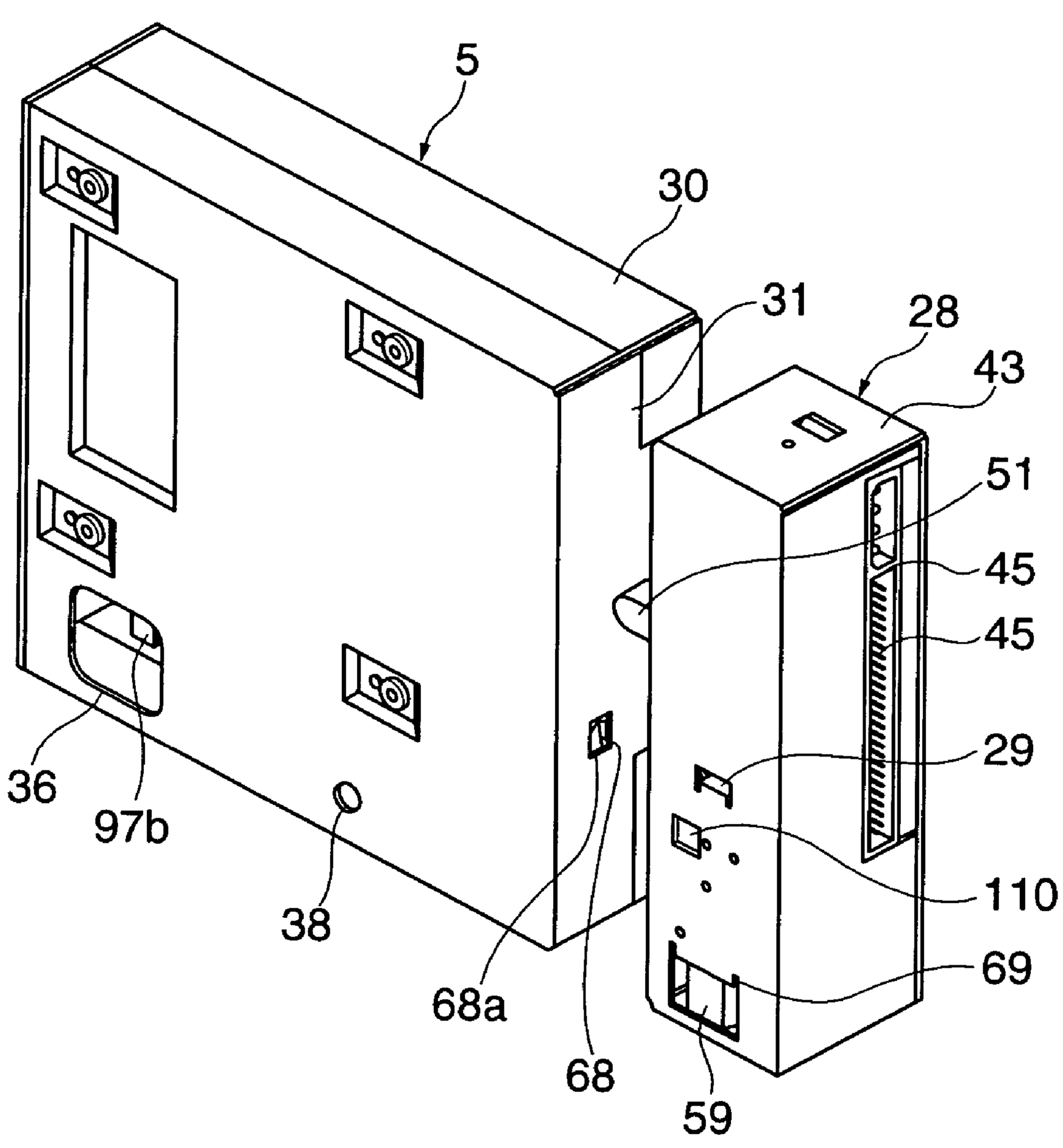
FIG. 13

FIG. 14



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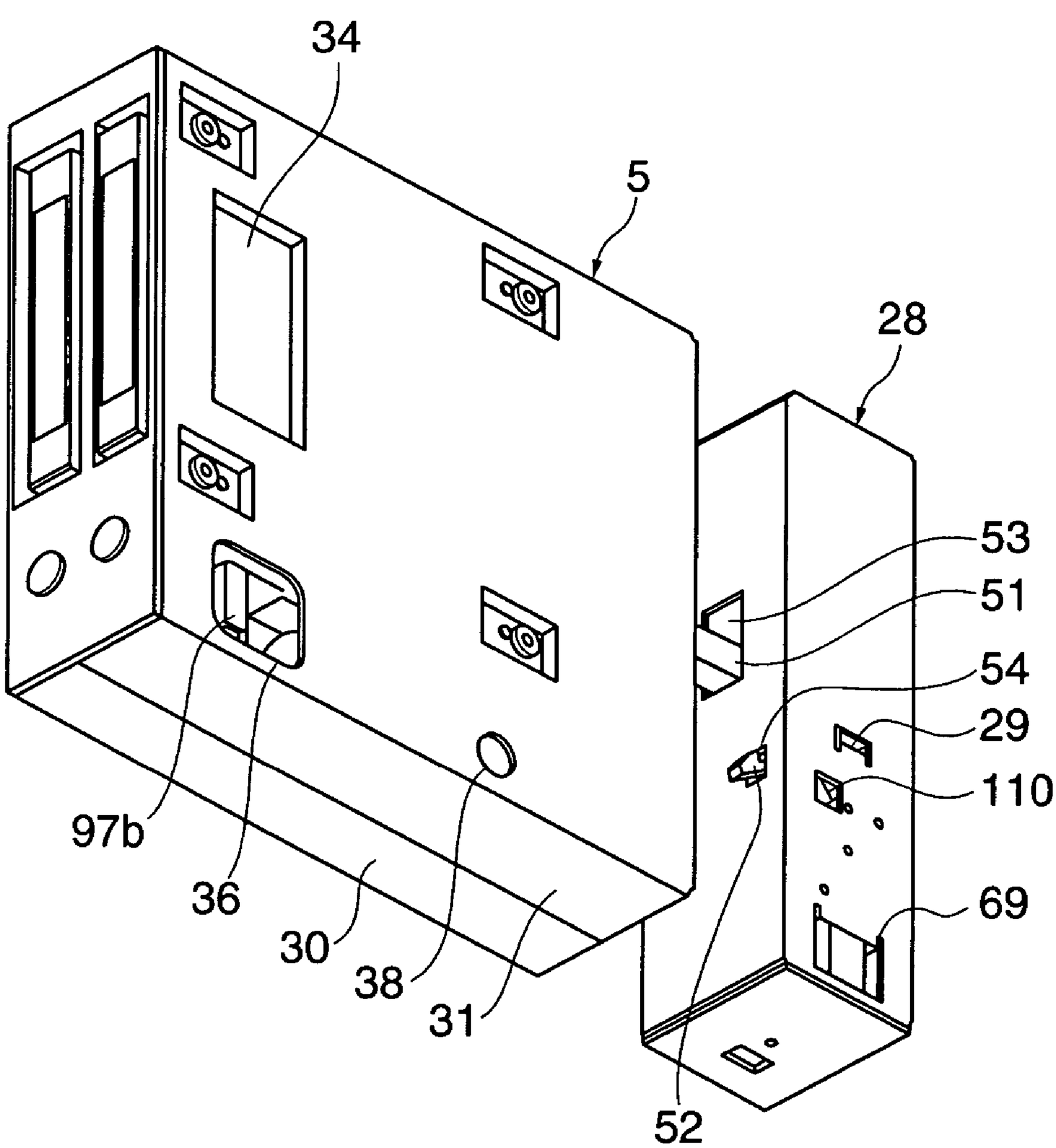


FIG. 16

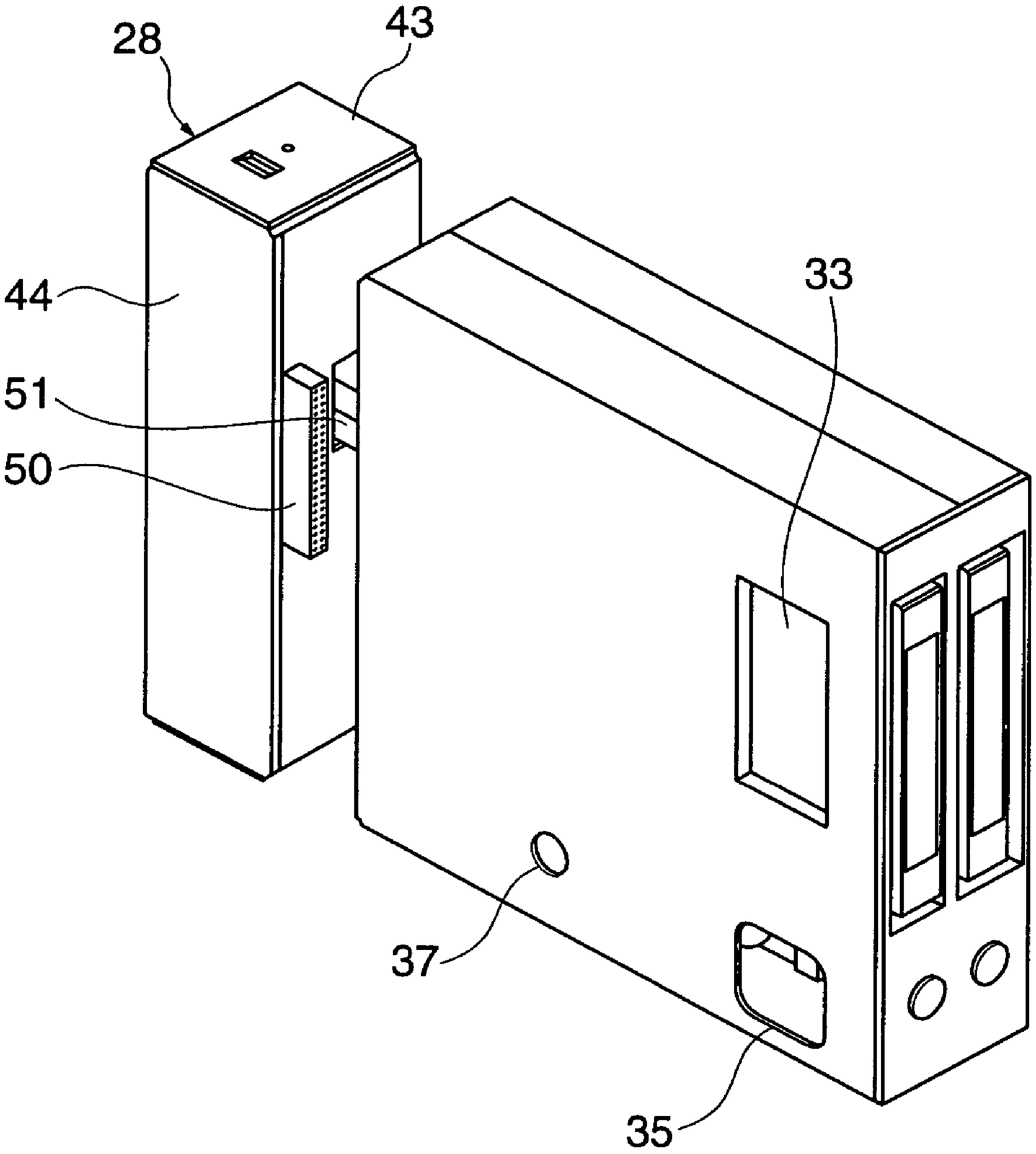
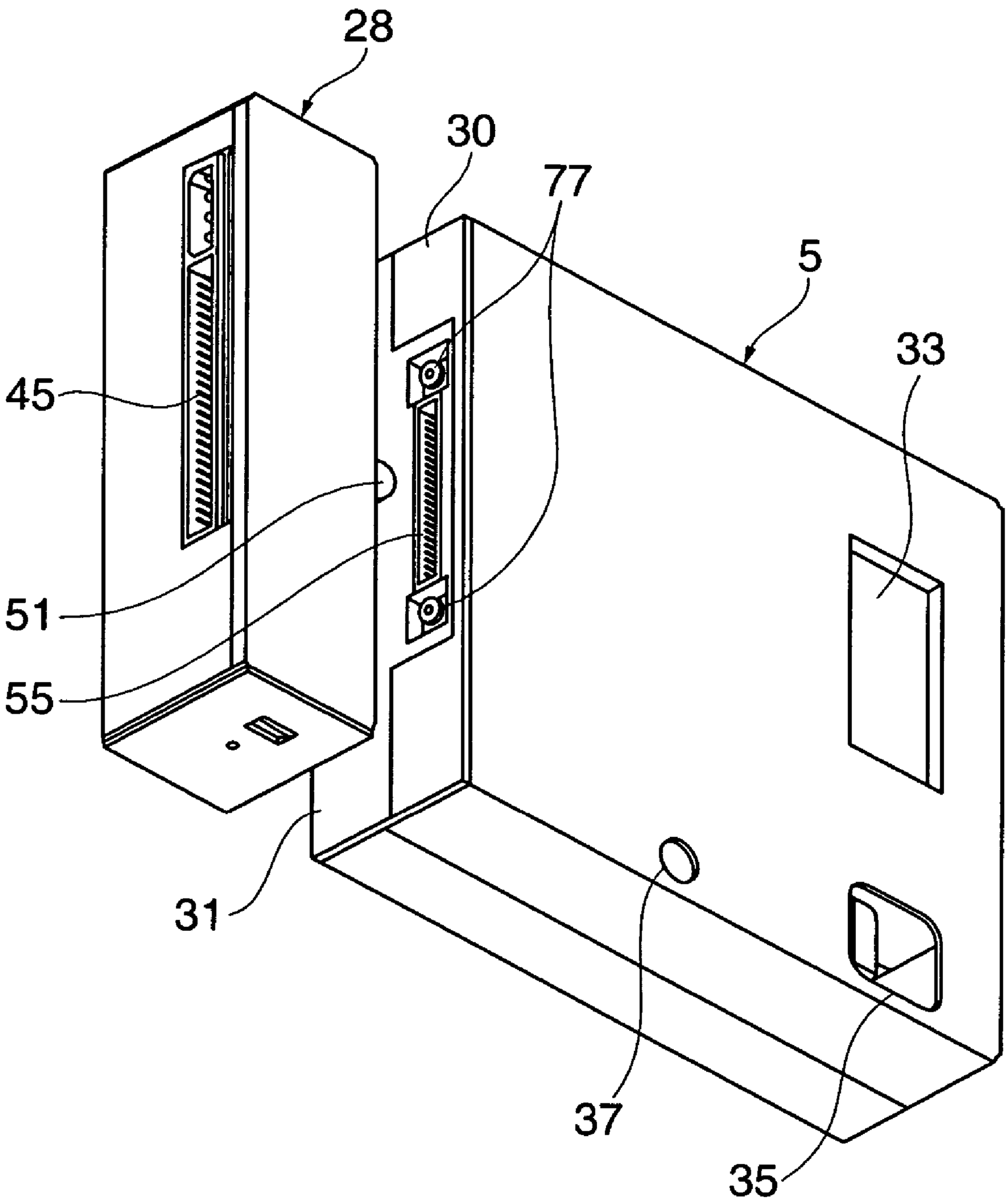


FIG. 17



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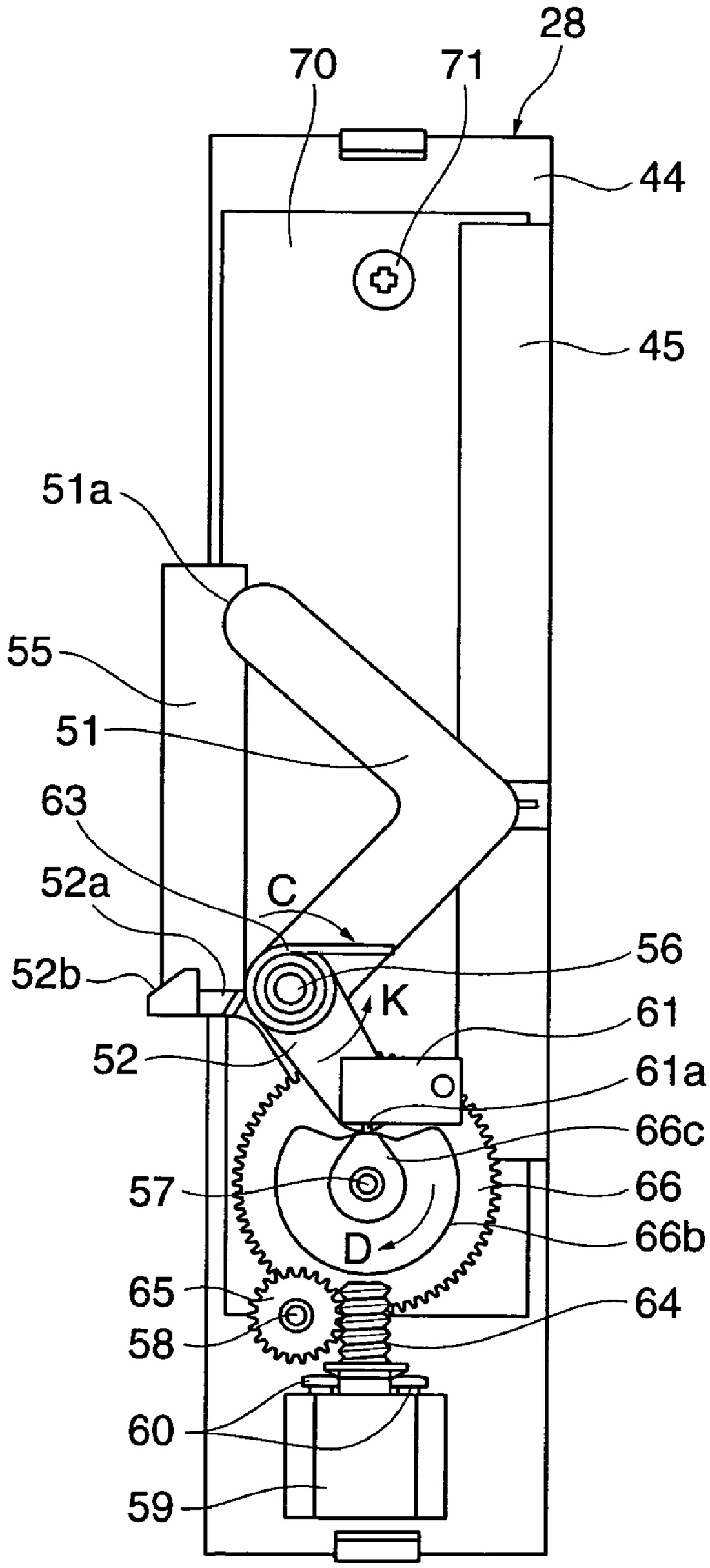
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FIG. 19

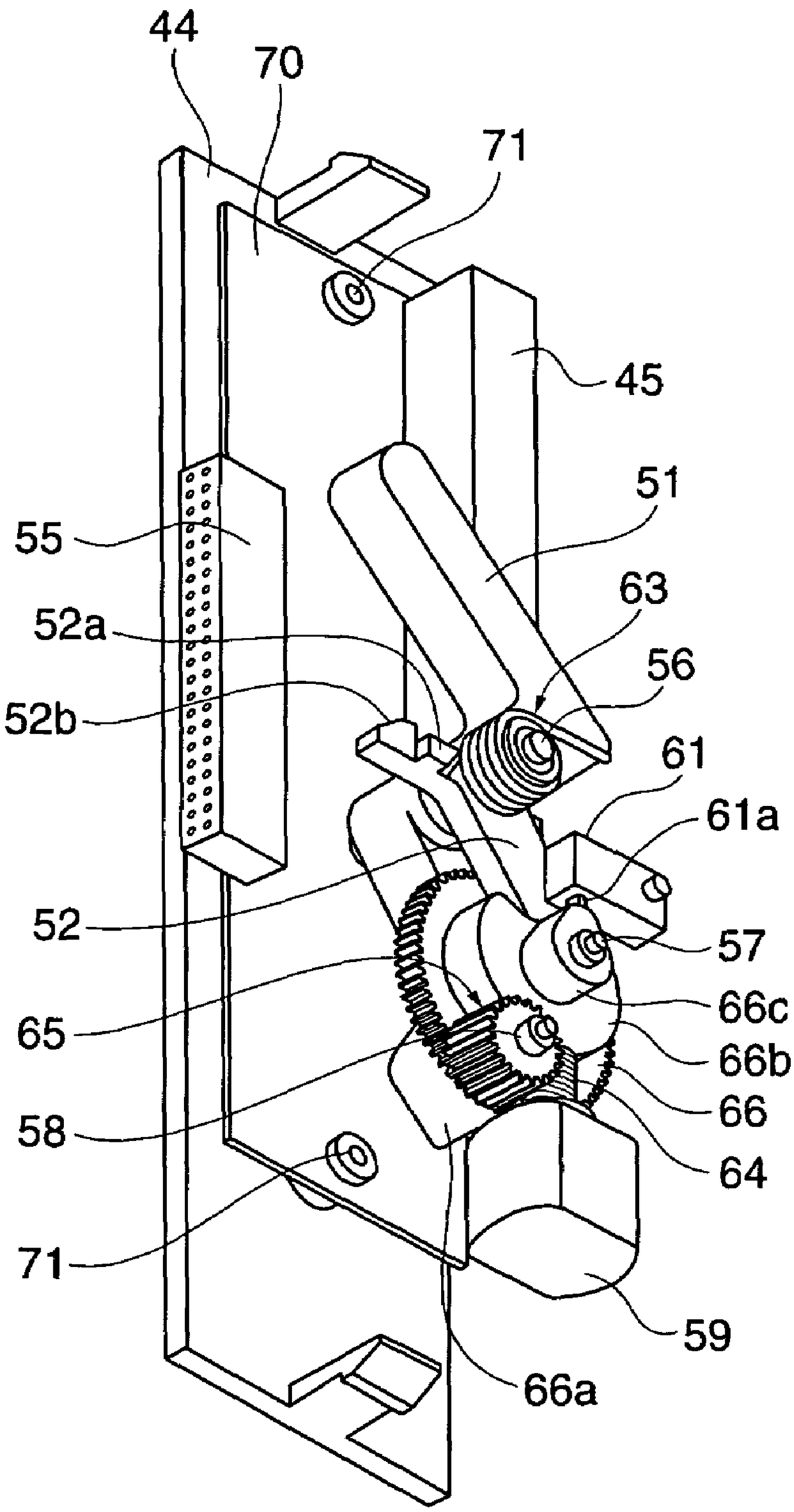
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FIG. 20

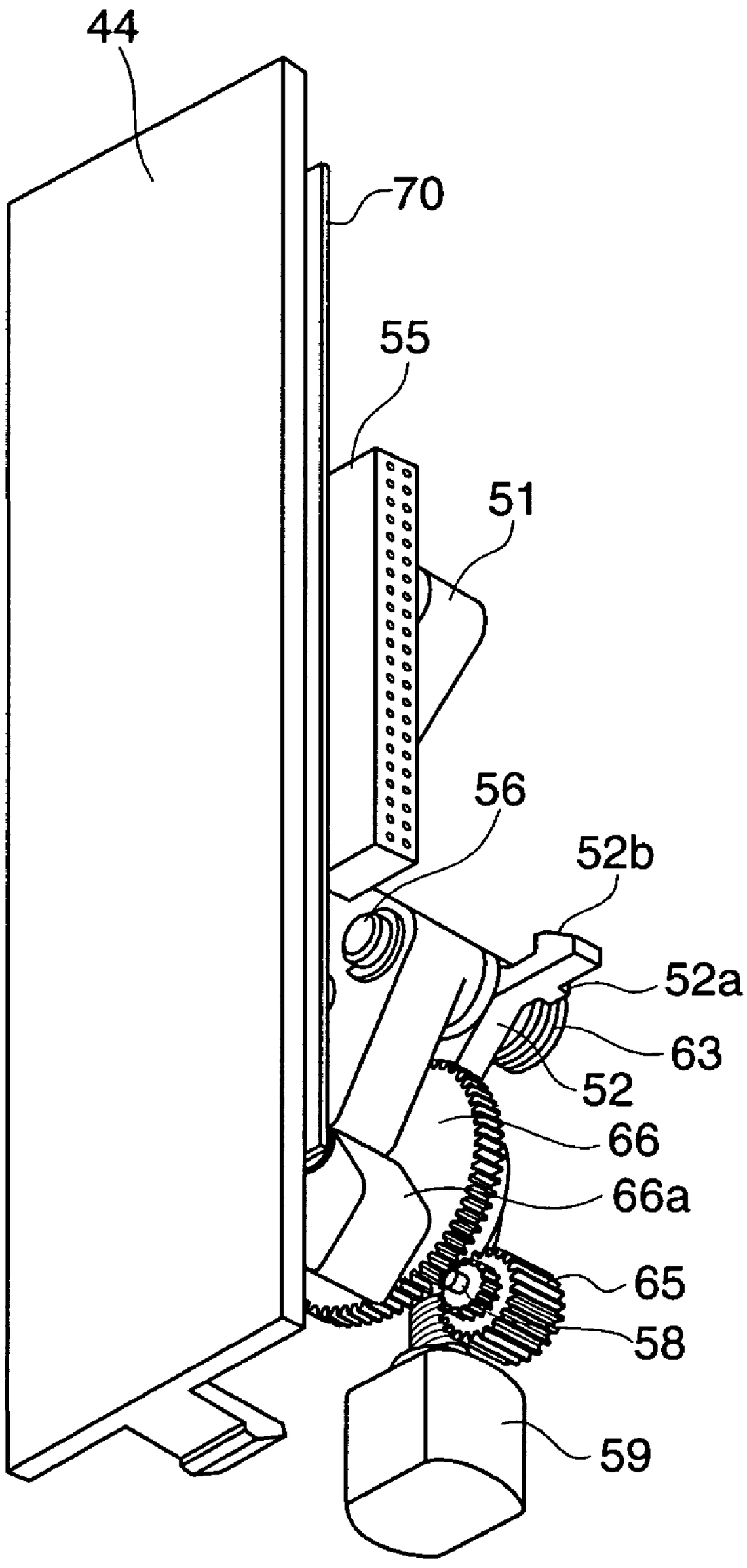

FIG. 21

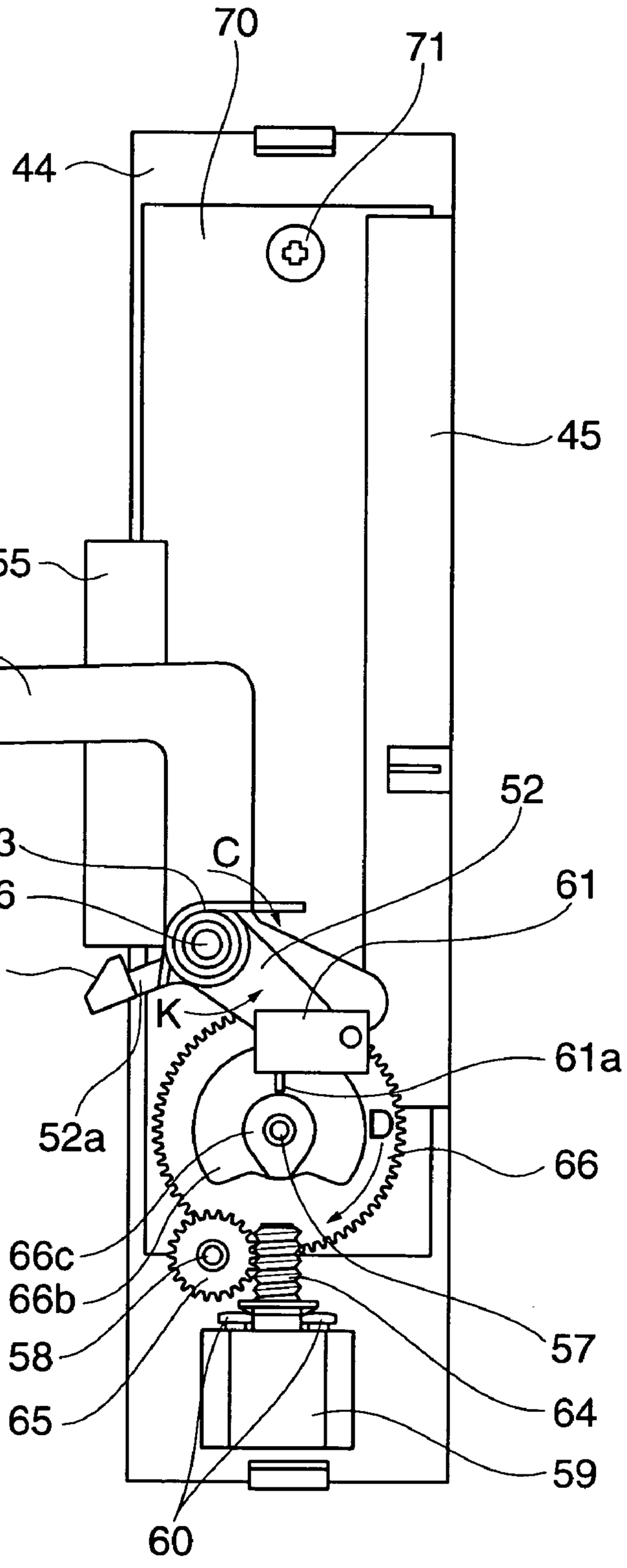
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FIG. 22

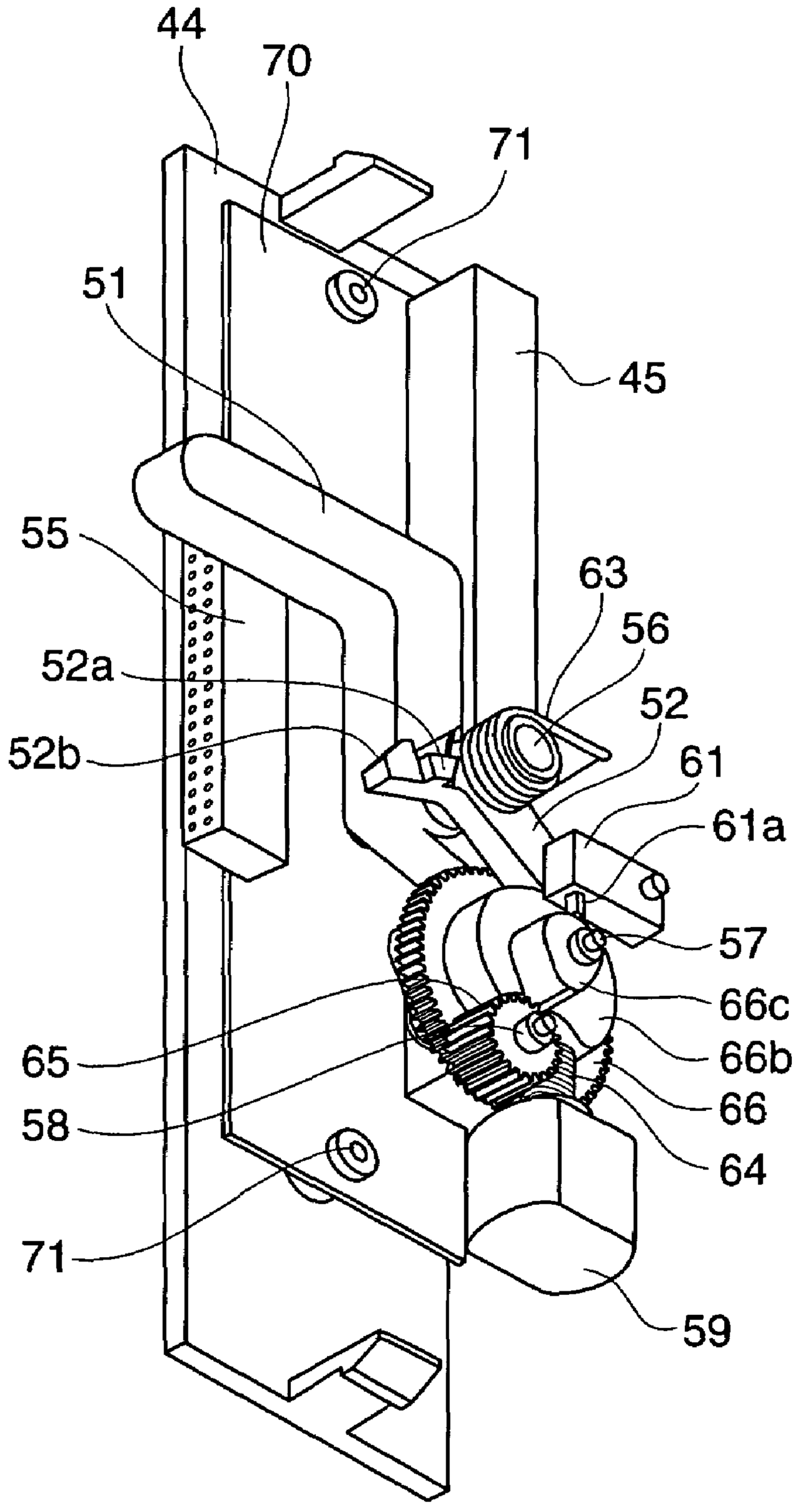
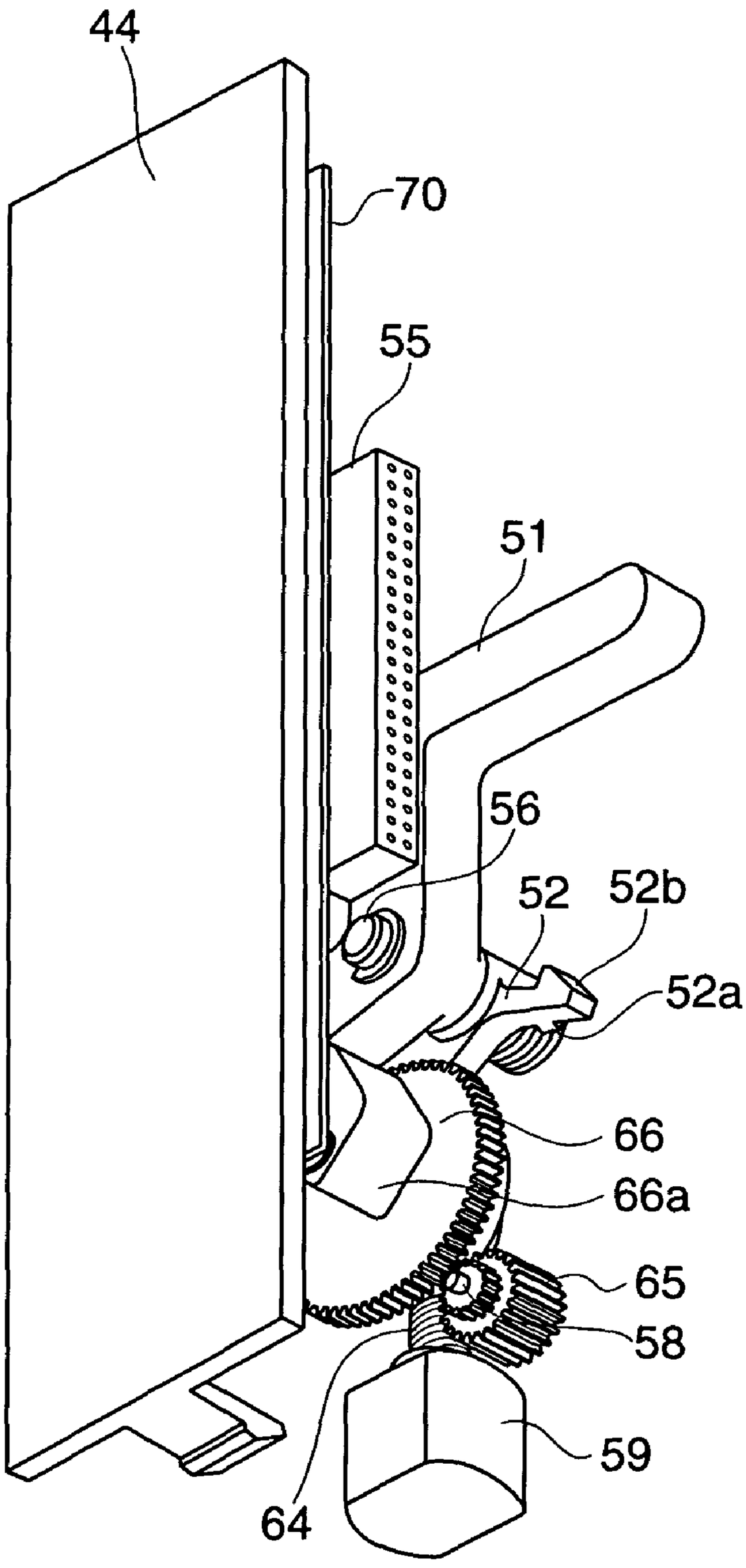


FIG. 23



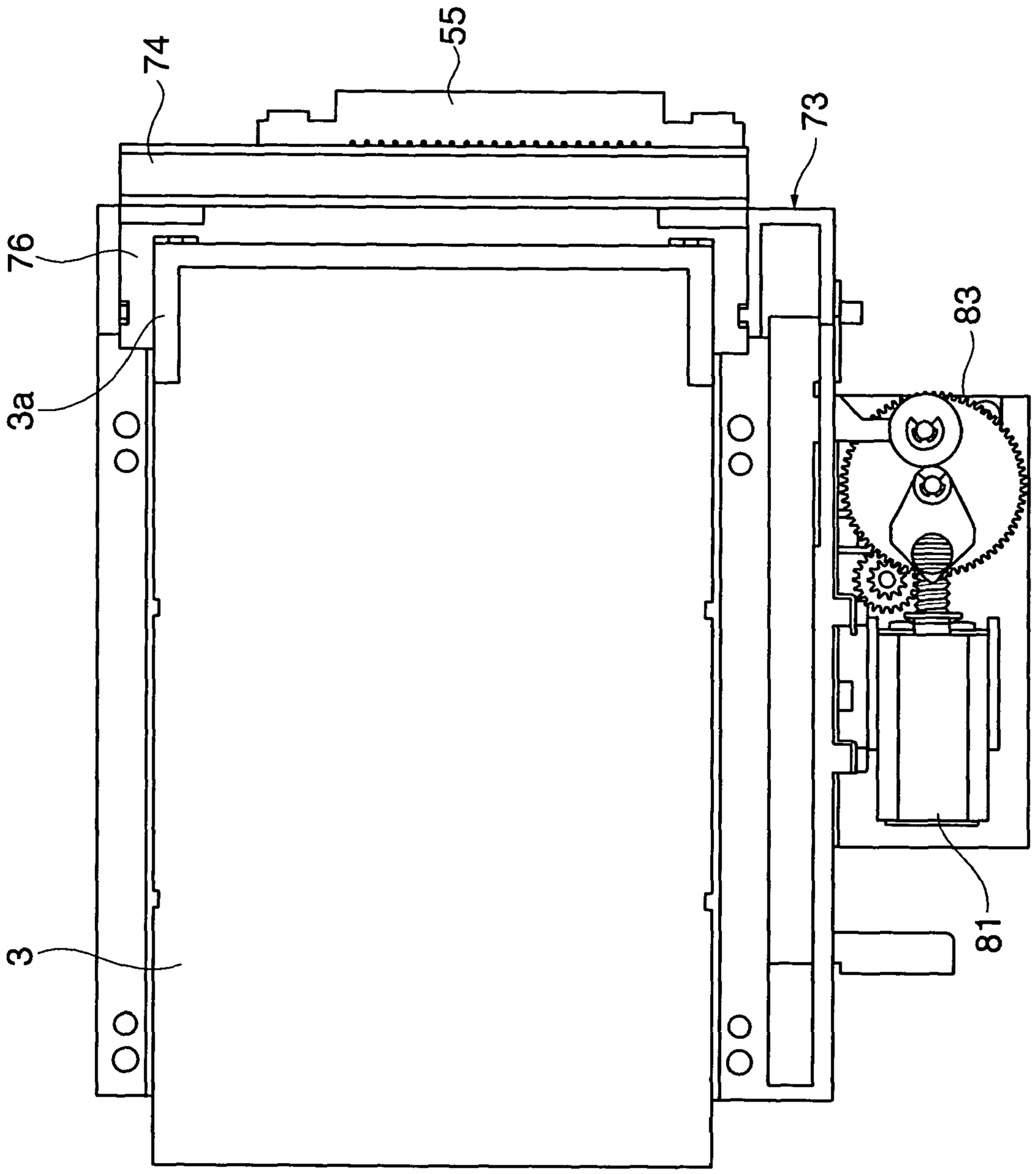


FIG. 24

FIG. 25

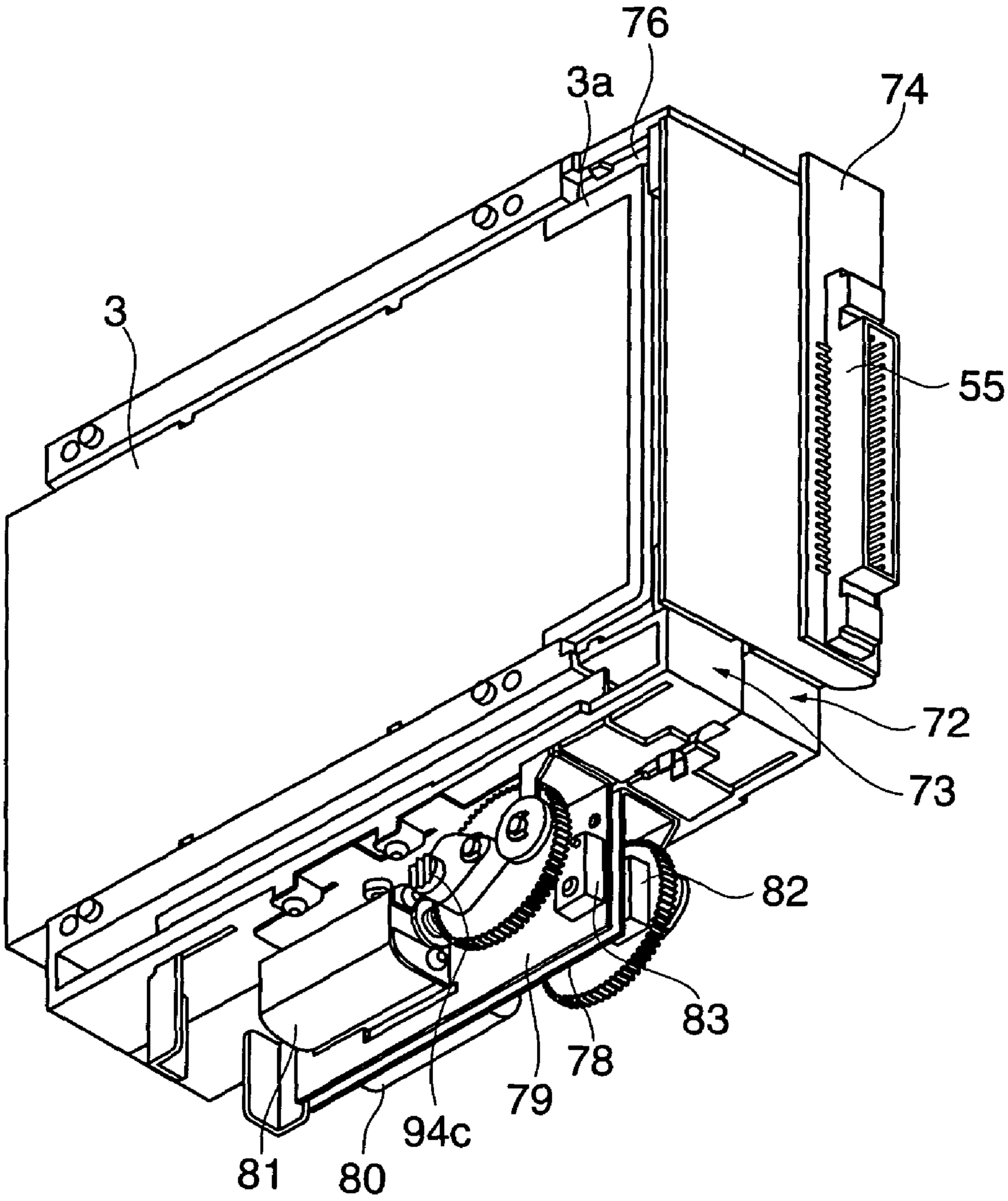


FIG. 26

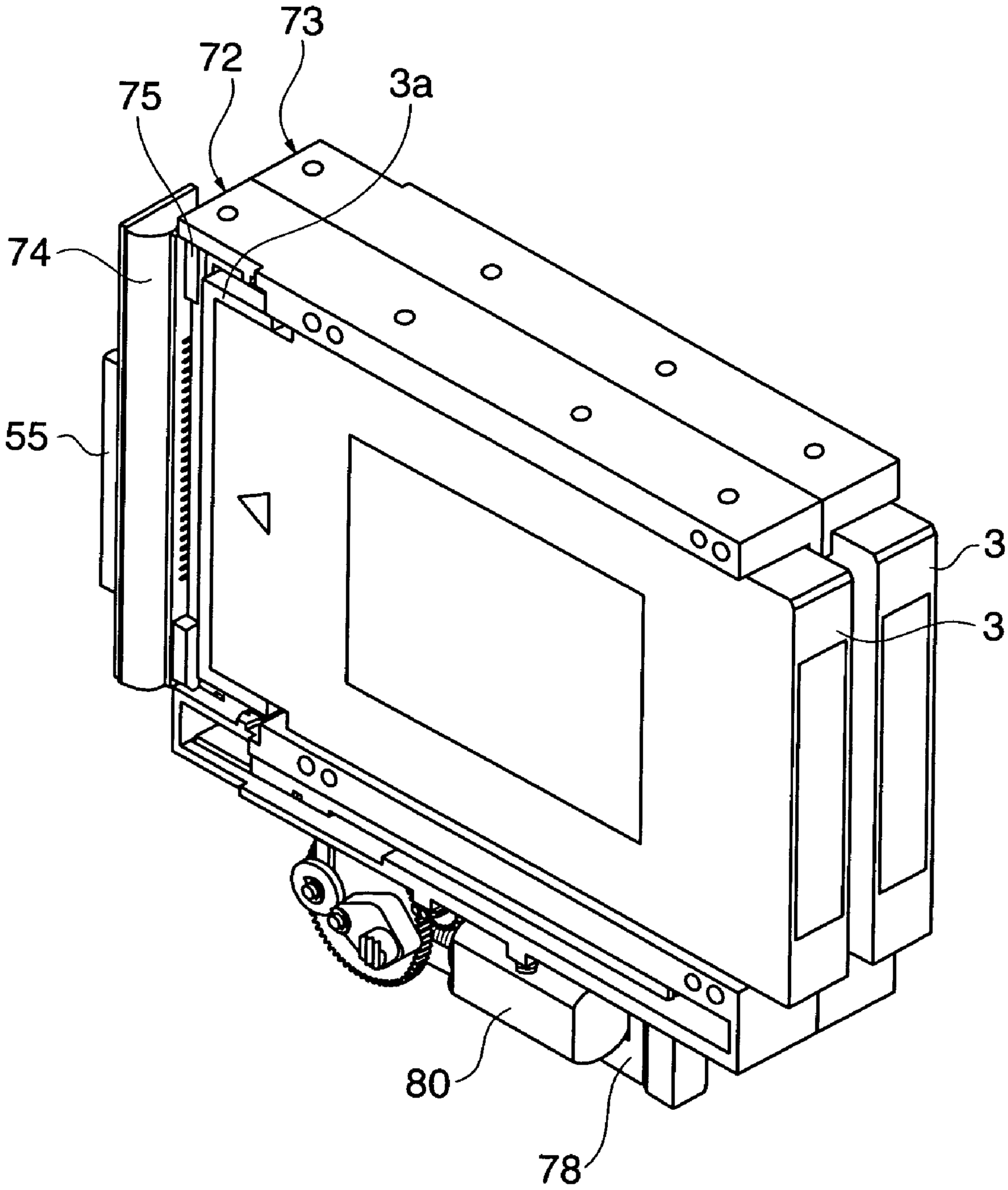


FIG. 27

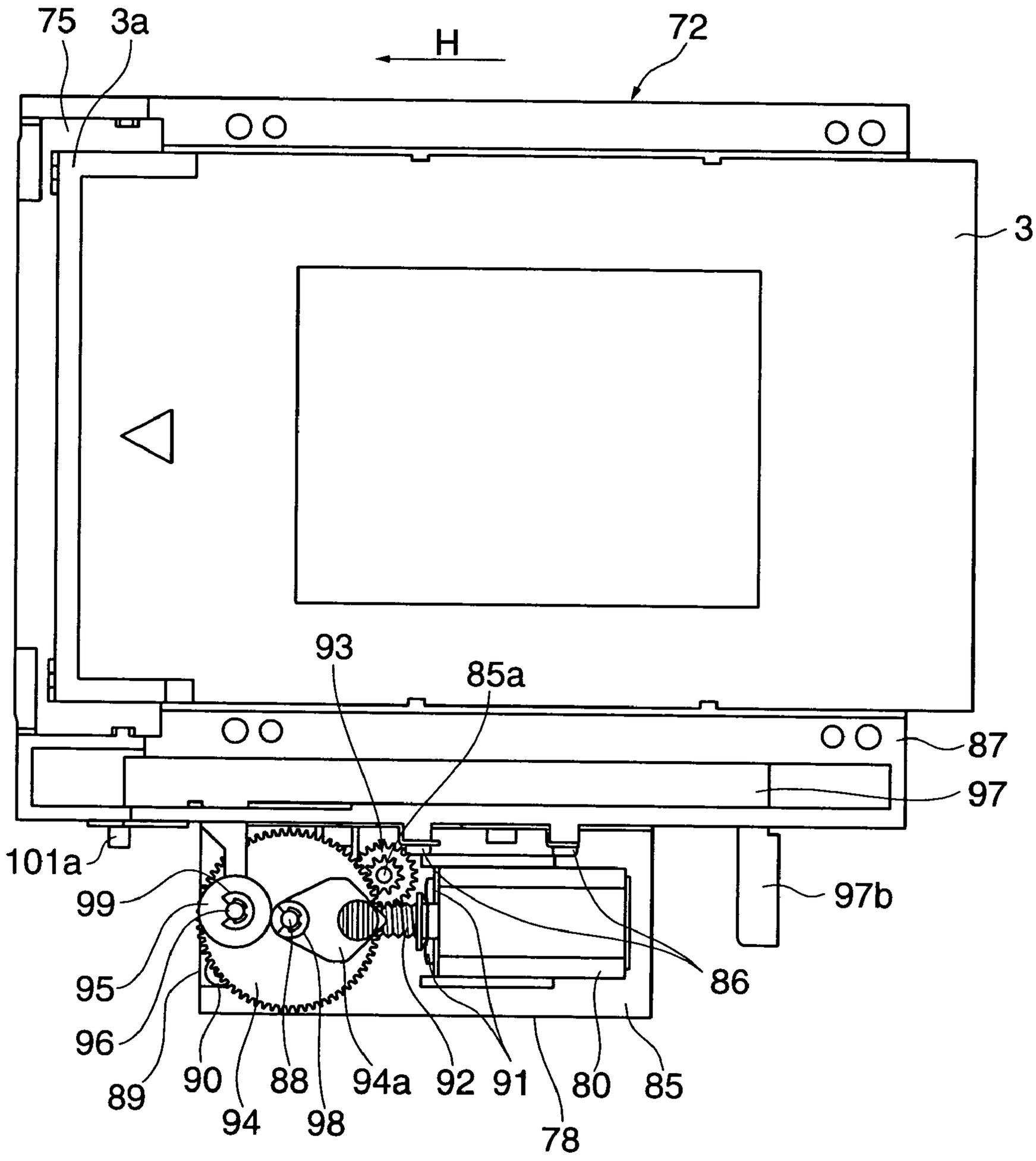

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FIG. 28

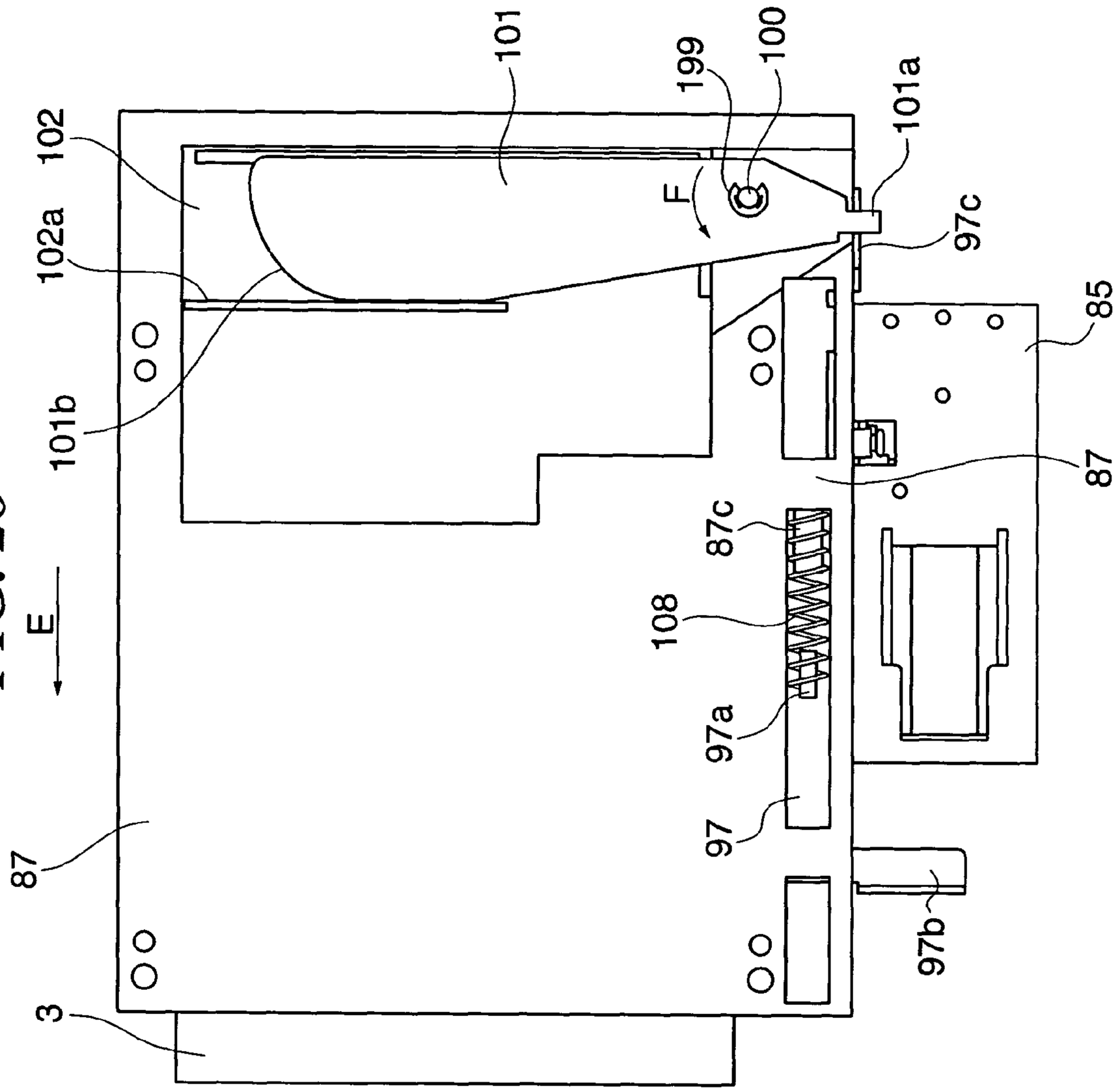

FIG. 29

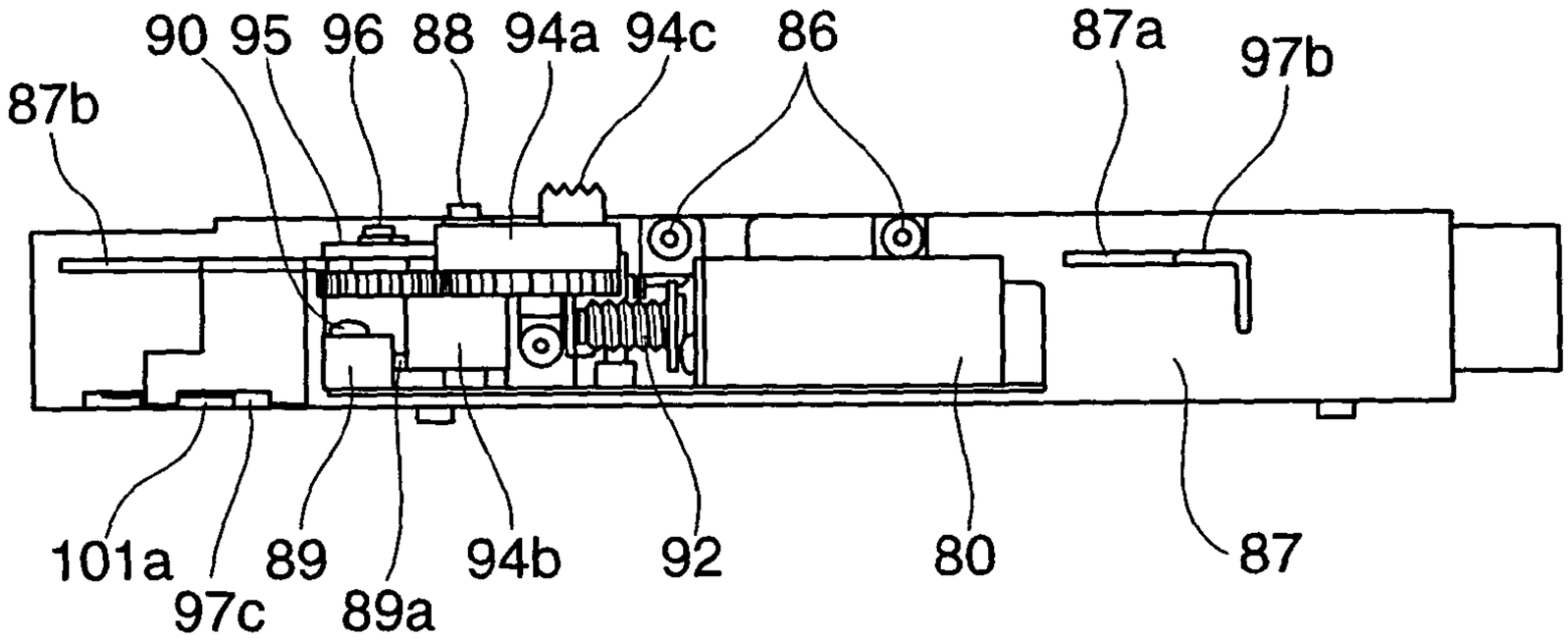
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FIG. 30

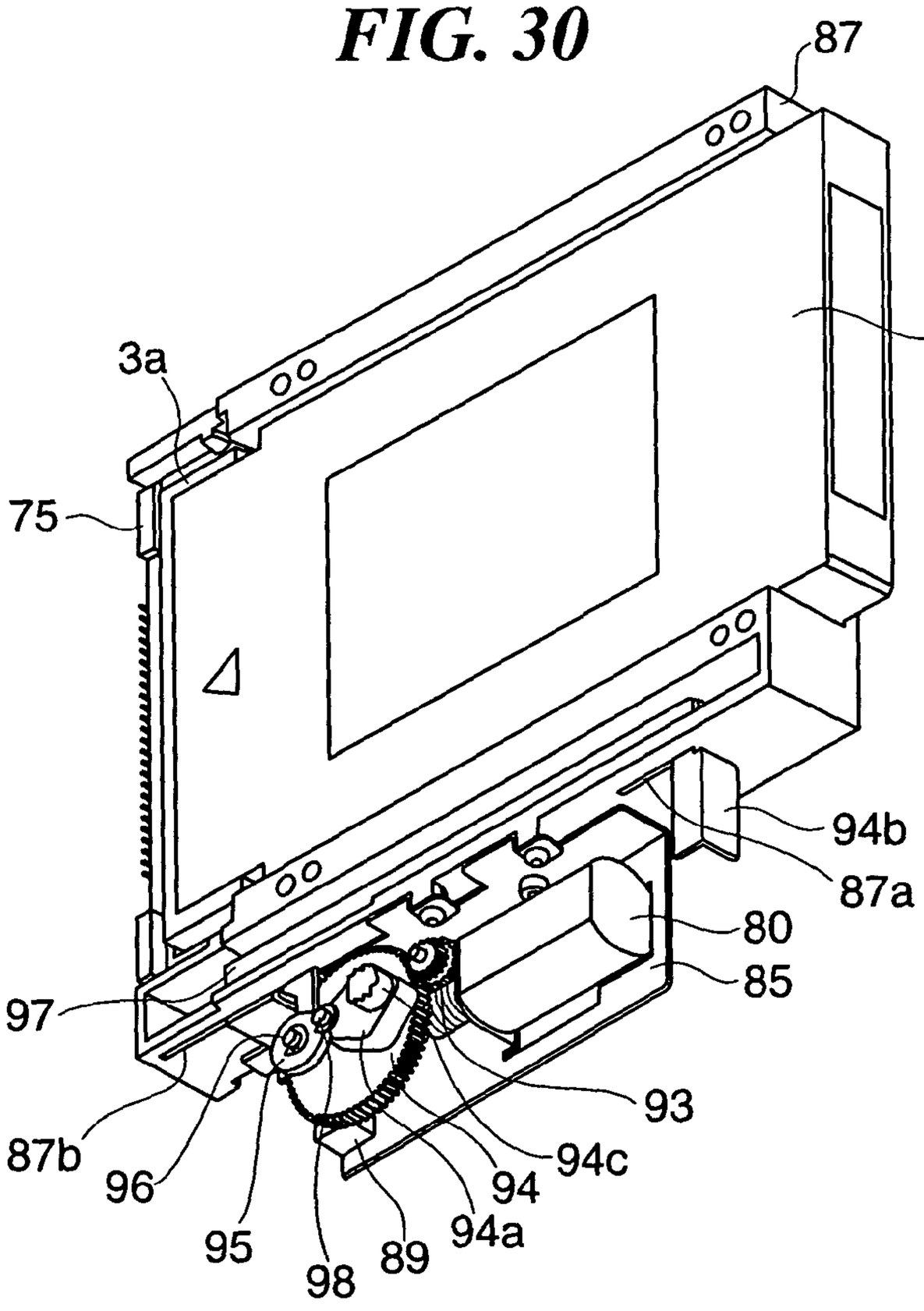
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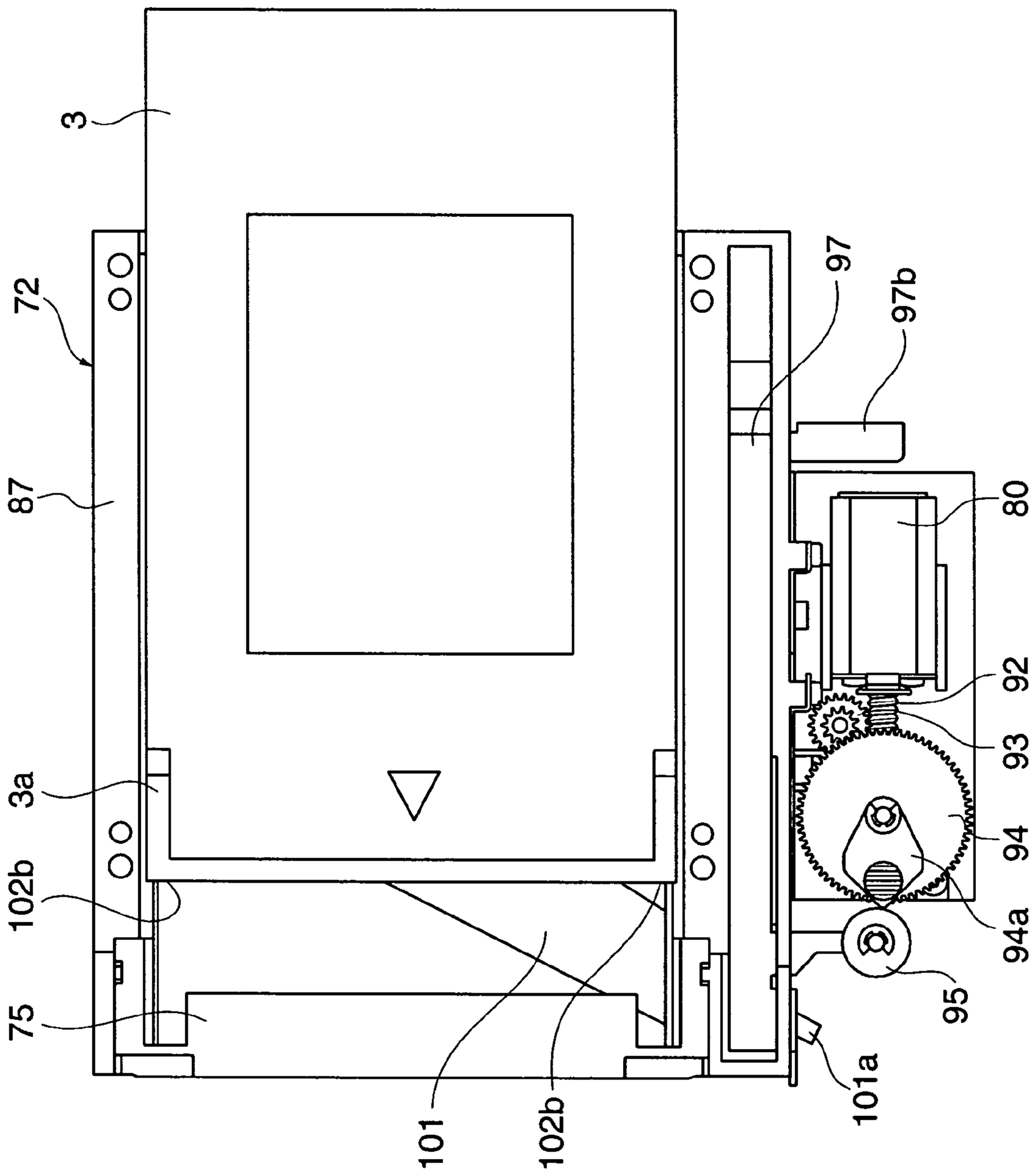
FIG. 31



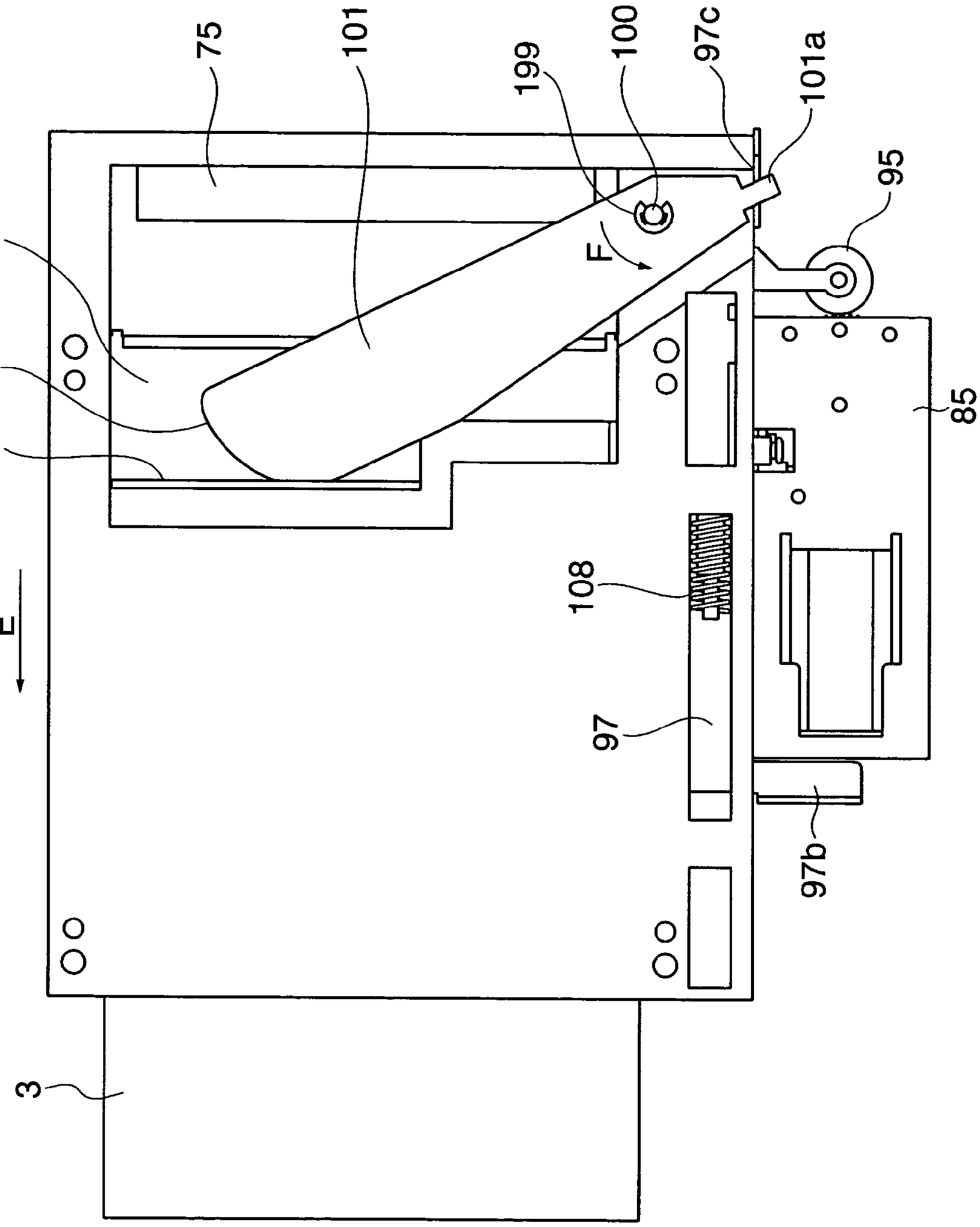


FIG. 32

FIG. 33

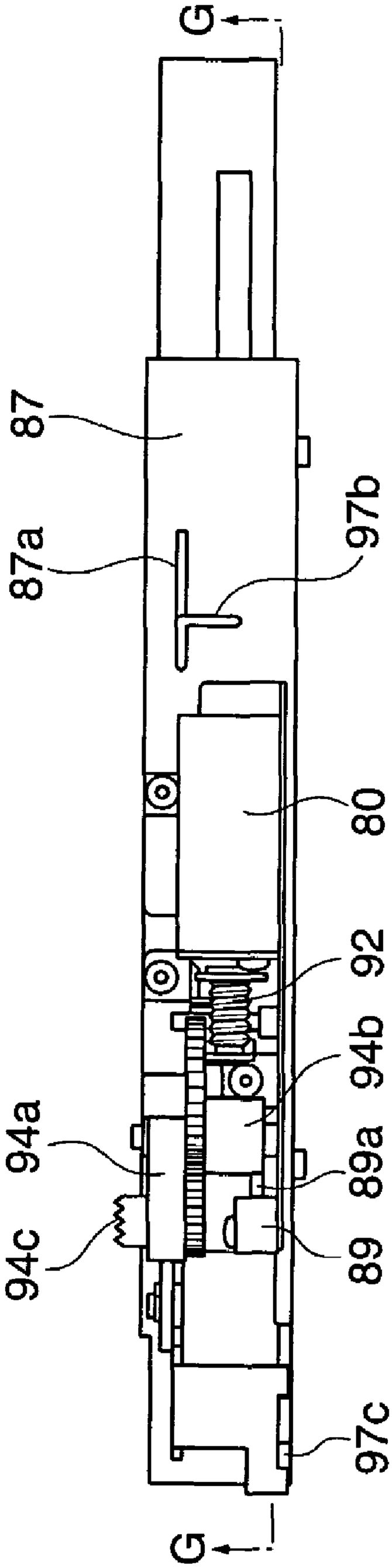


FIG. 34

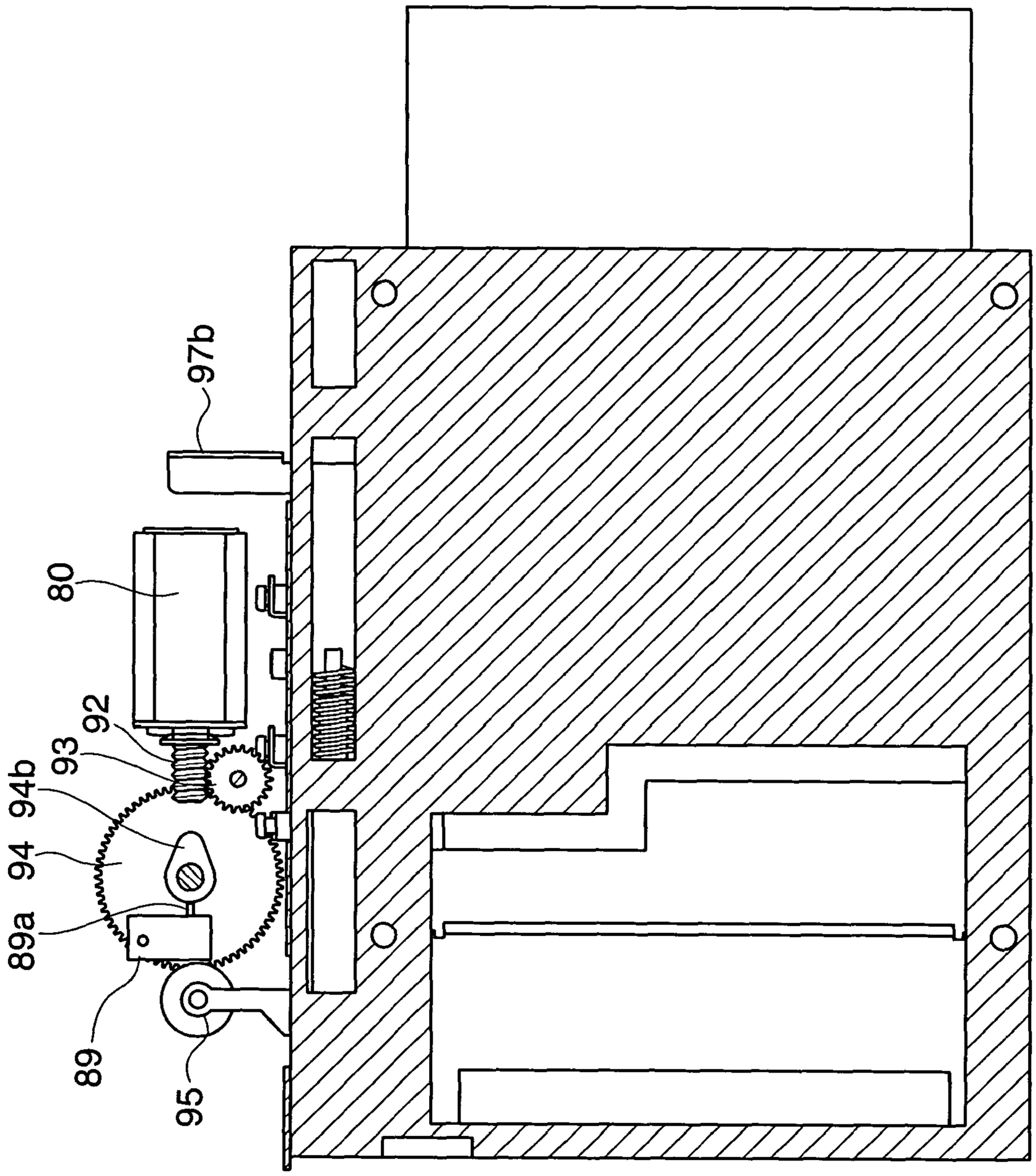


FIG. 35

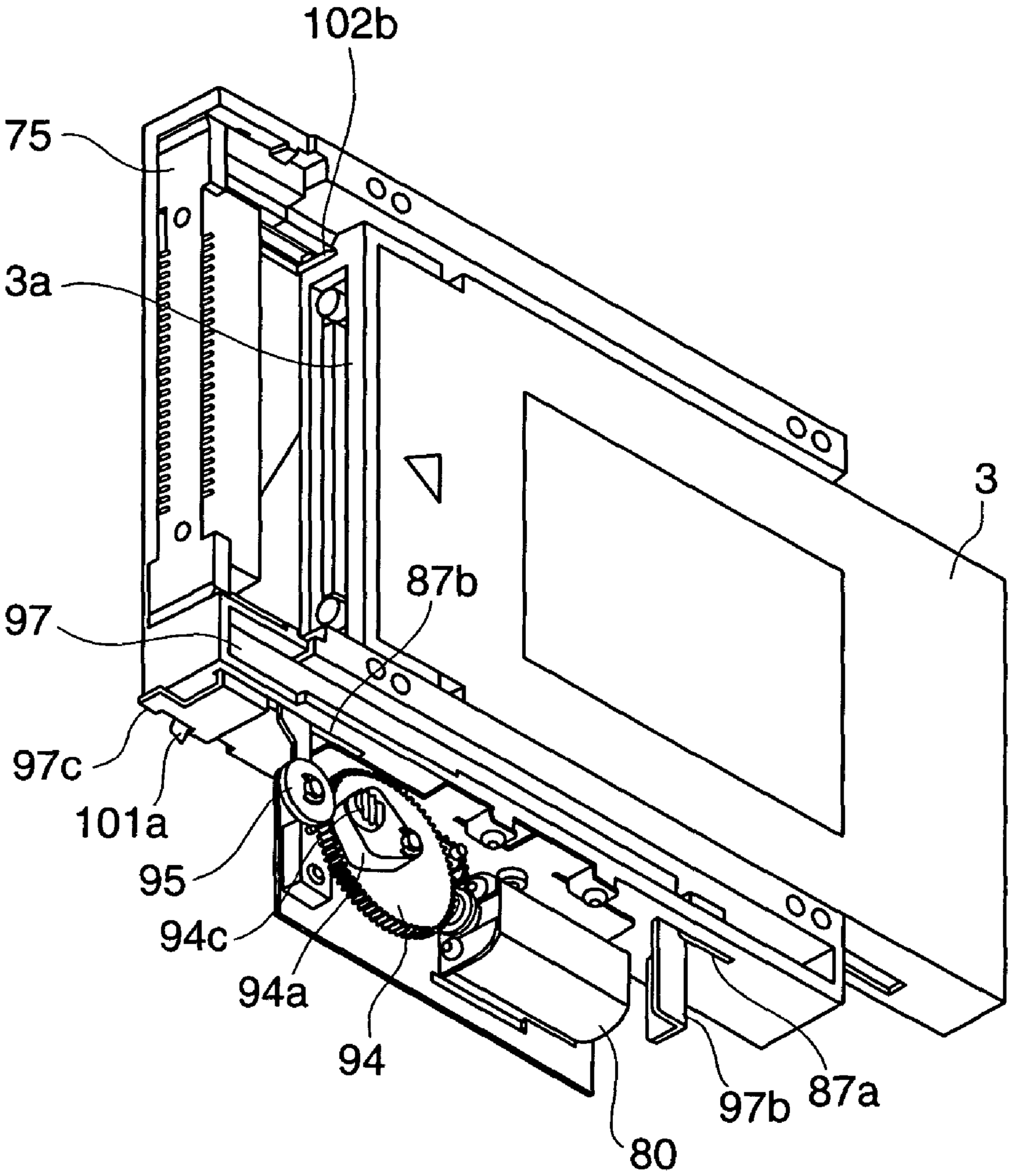


FIG. 36

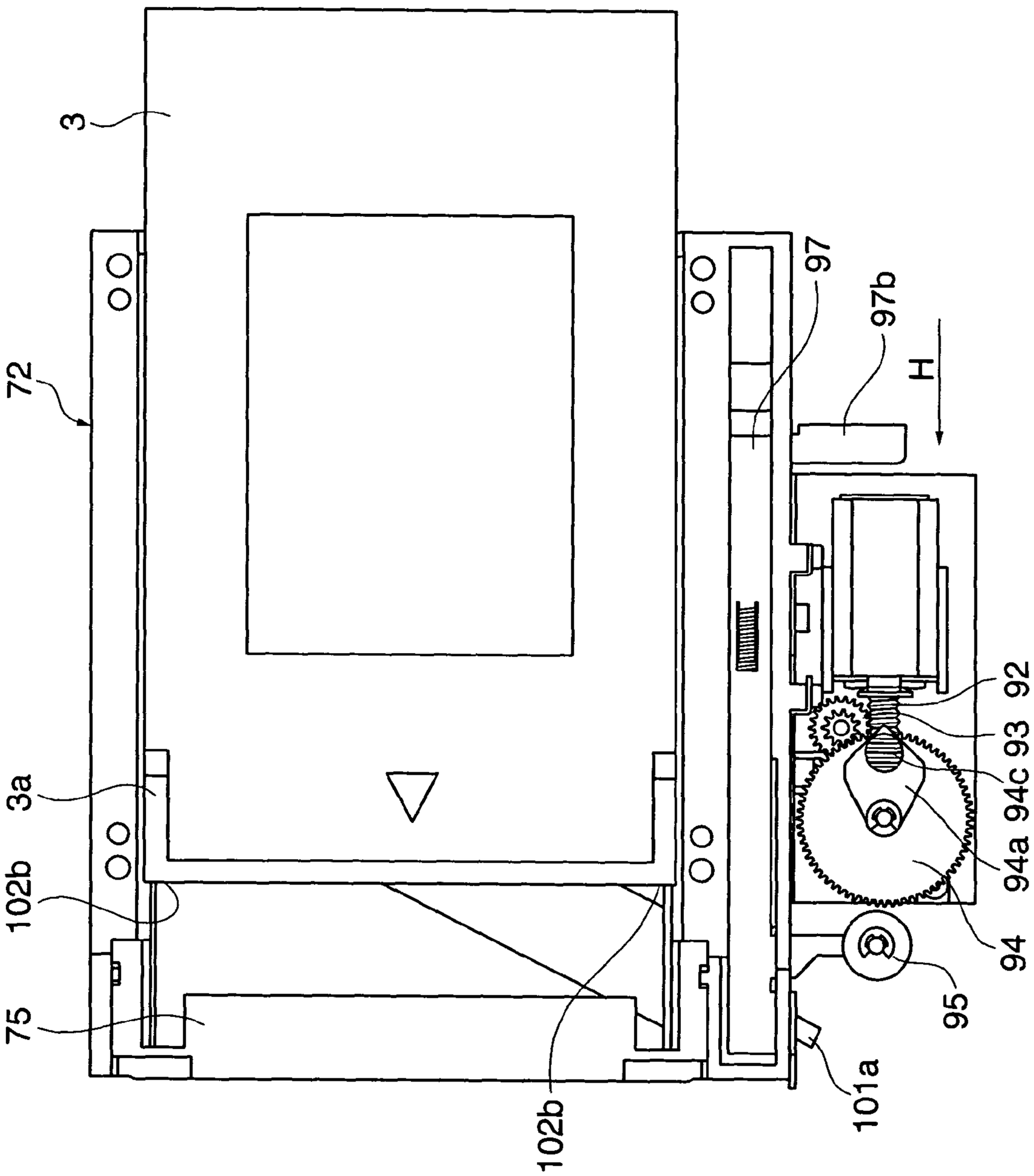


FIG. 37

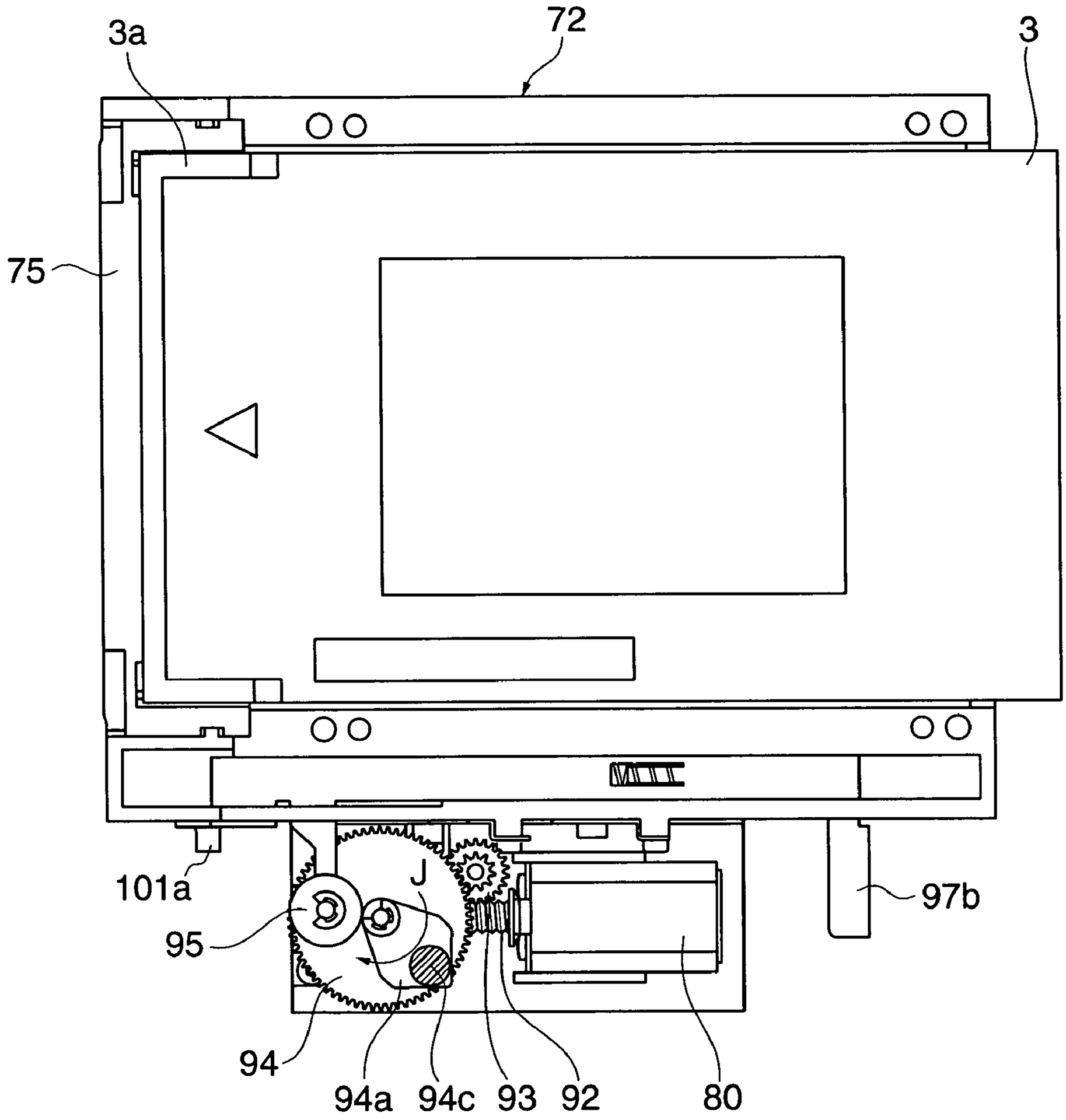


FIG. 38

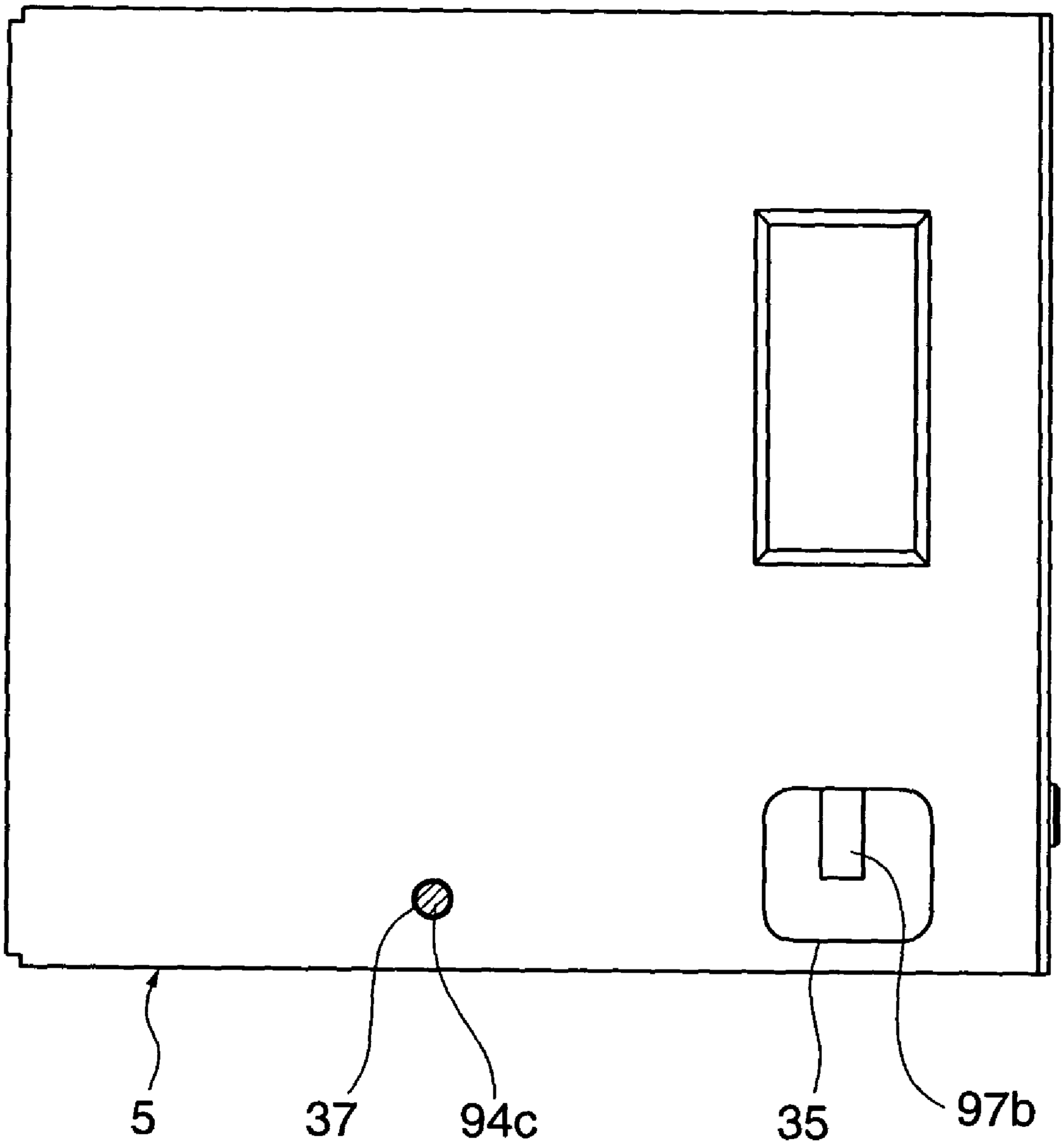
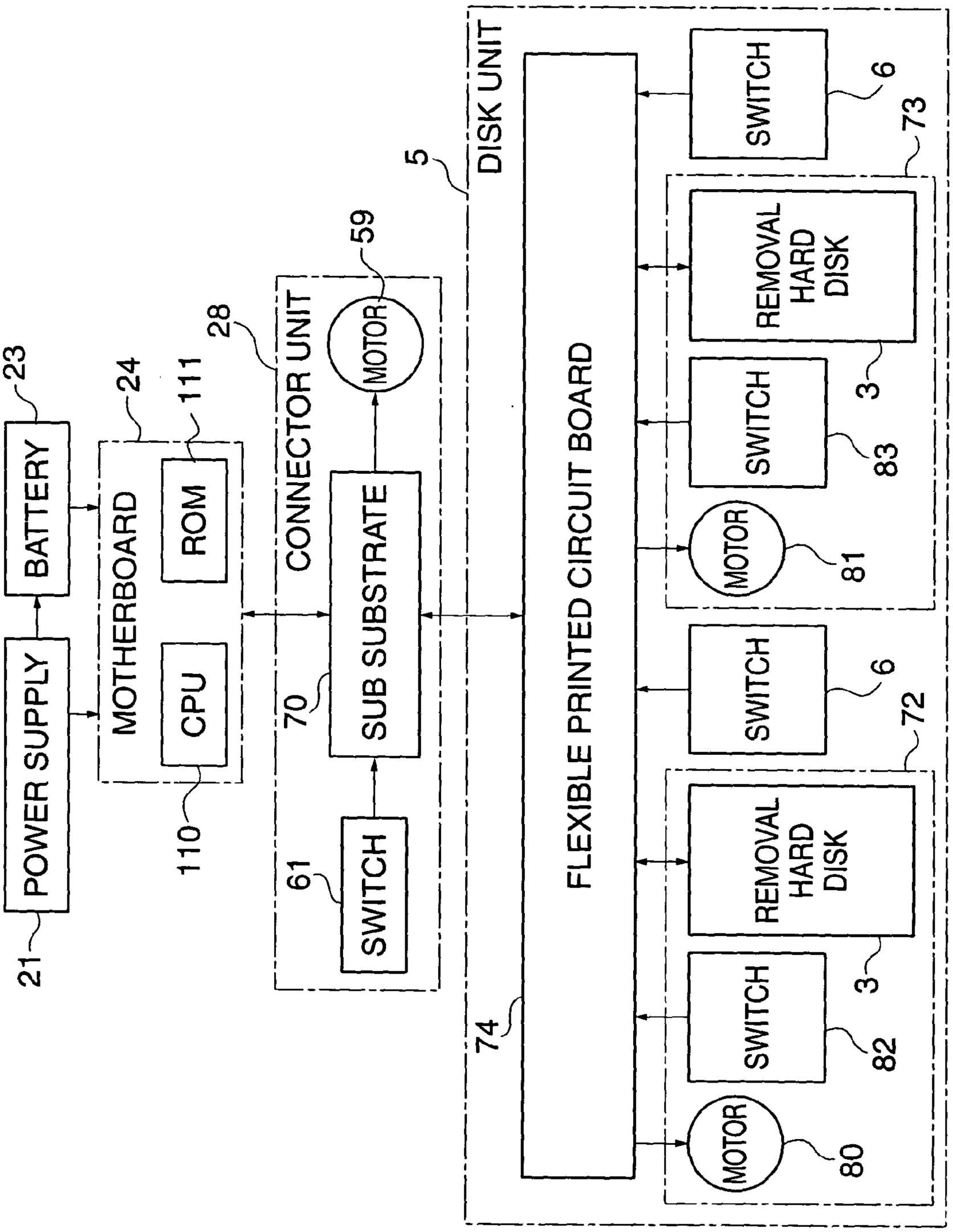


FIG. 39


DISK UNIT
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REMOVAL HARD DISK
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3
SWITCH
82
MOTOR
80
74
FLEXIBLE PRINTED CIRCUIT BOARD
CONNECTOR UNIT
28
MOTOR
59
SUB SUBSTRATE
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SWITCH
61
MOTHERBOARD
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ROM
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CPU
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POWER SUPPLY
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BATTERY
23

FIG. 40

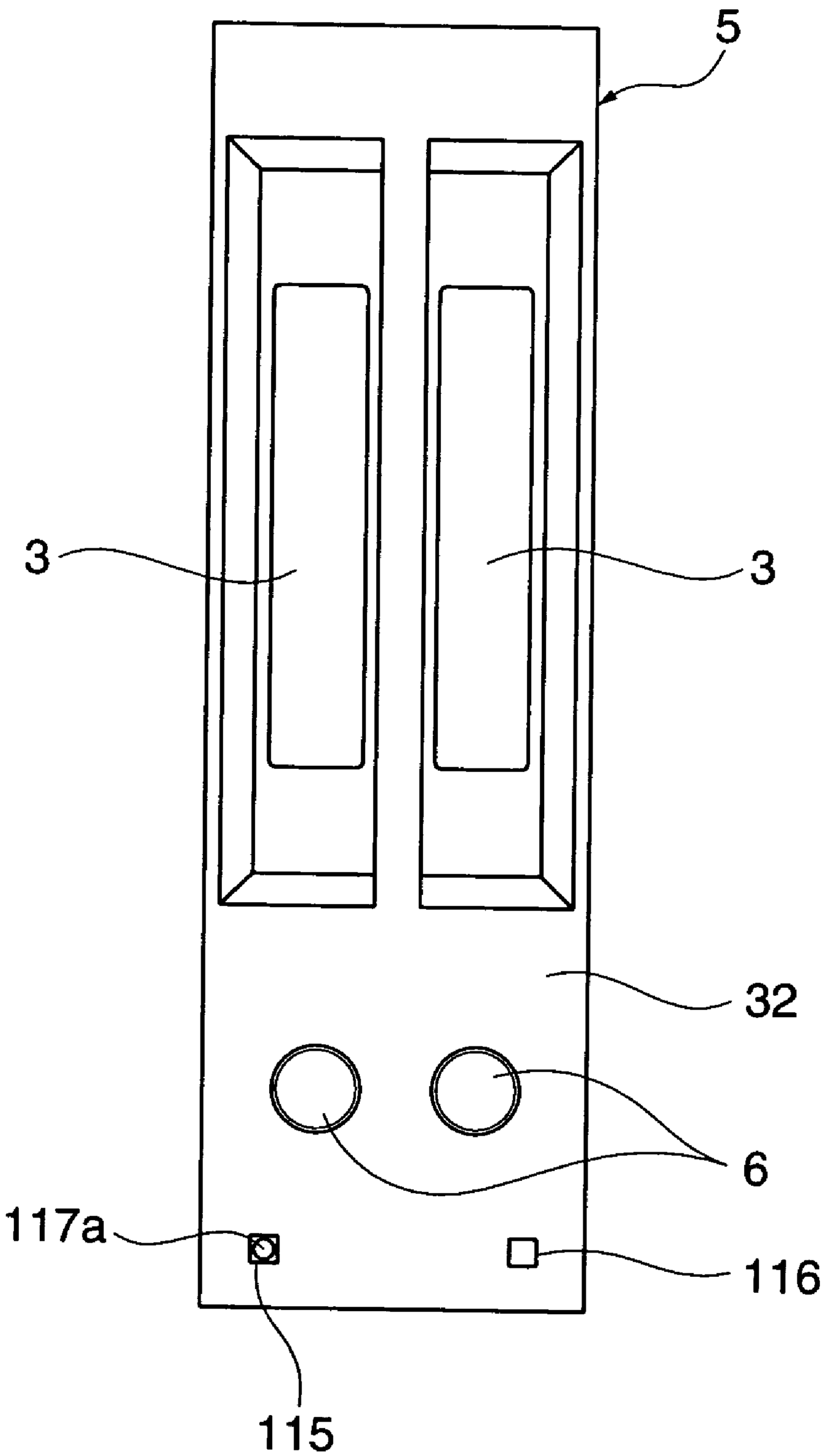


FIG. 41

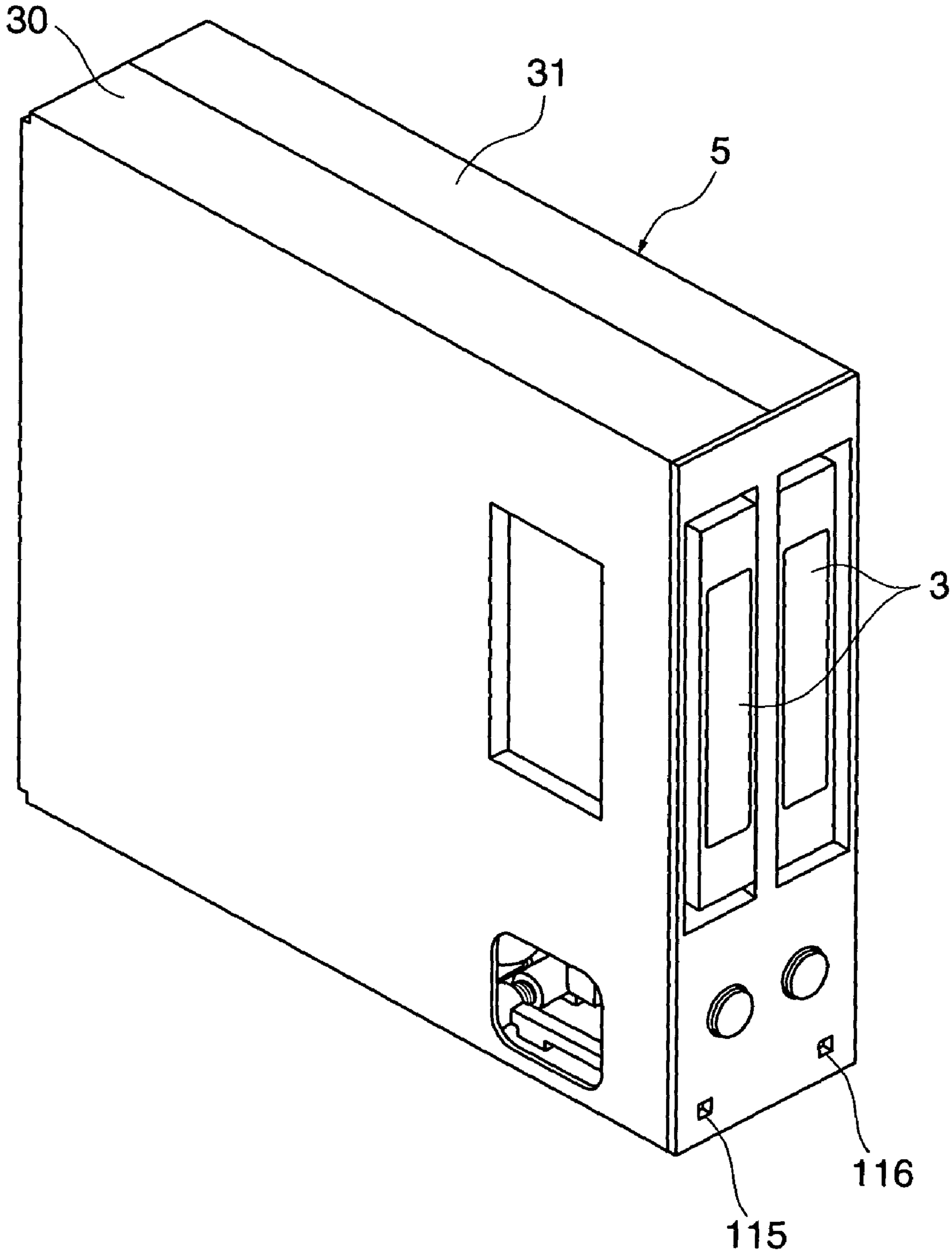


FIG. 42

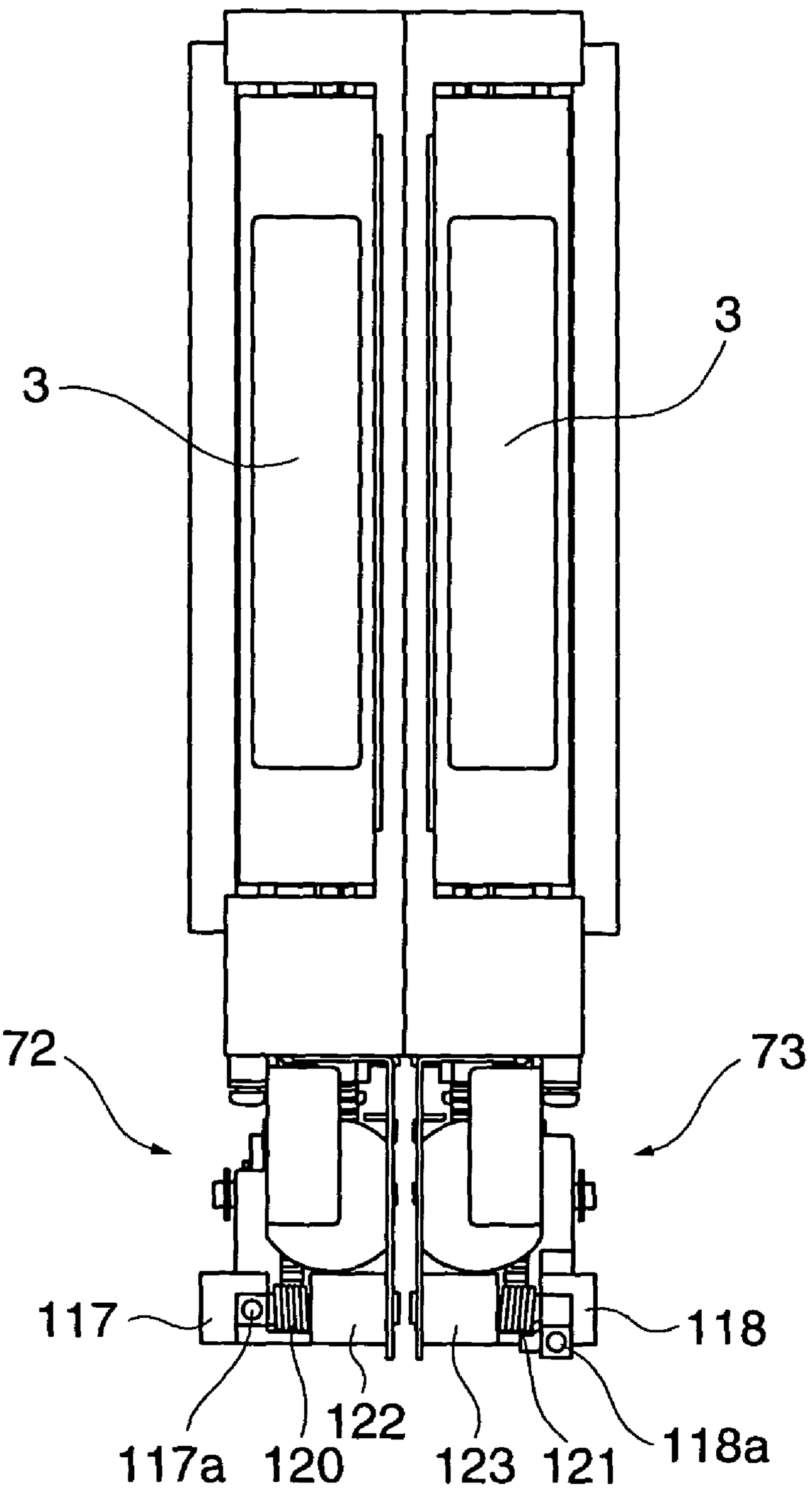


FIG. 43

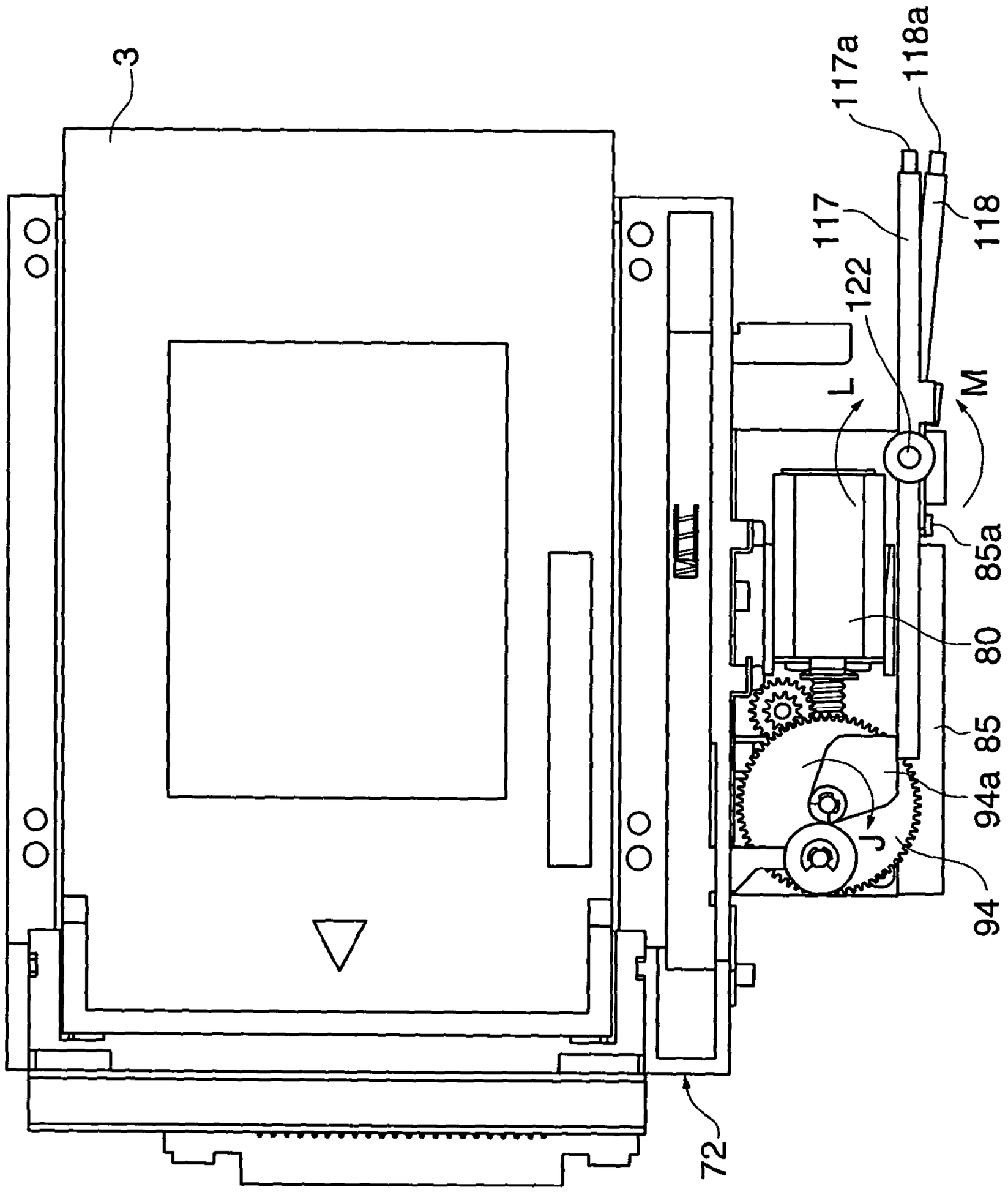


FIG. 44

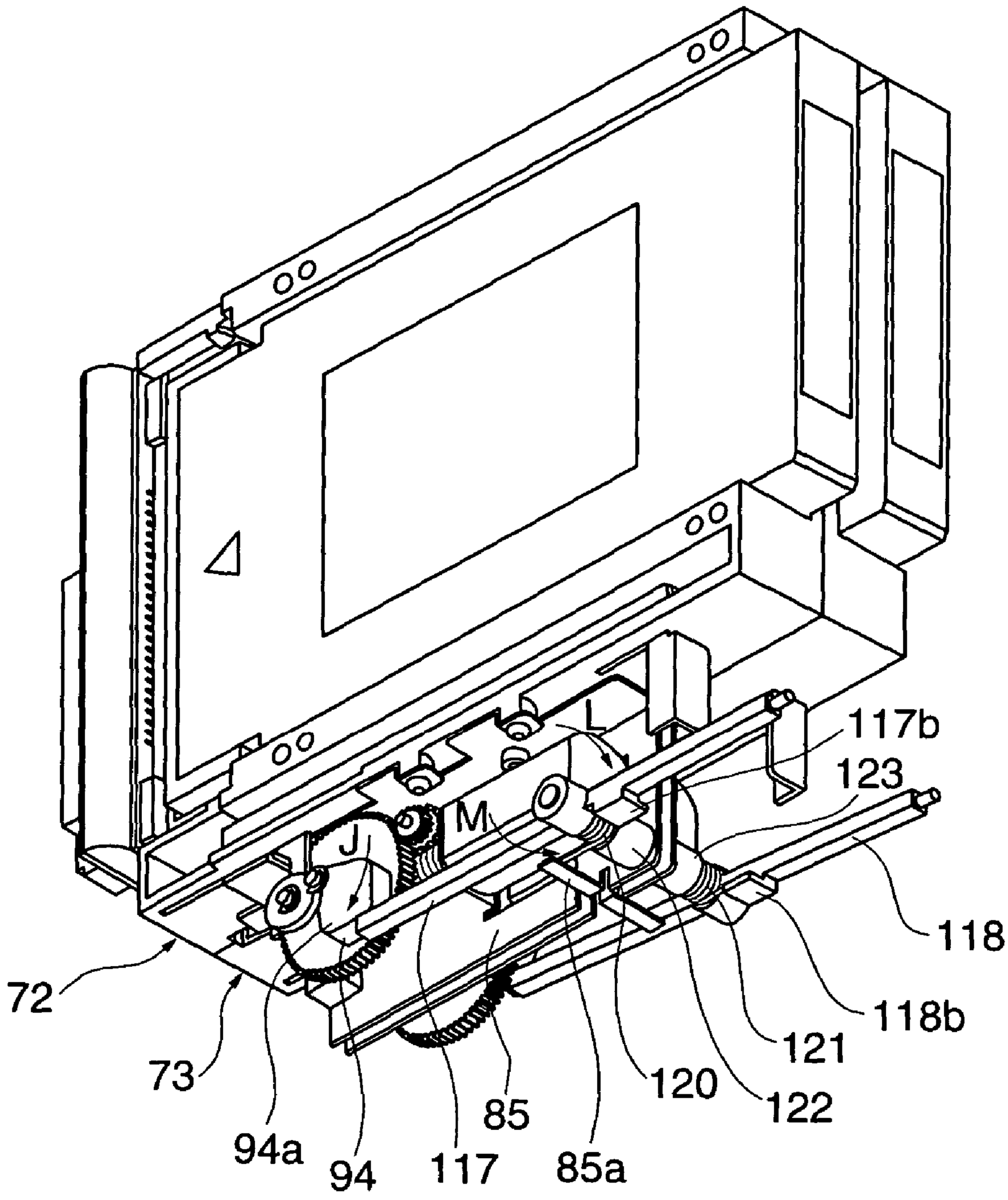
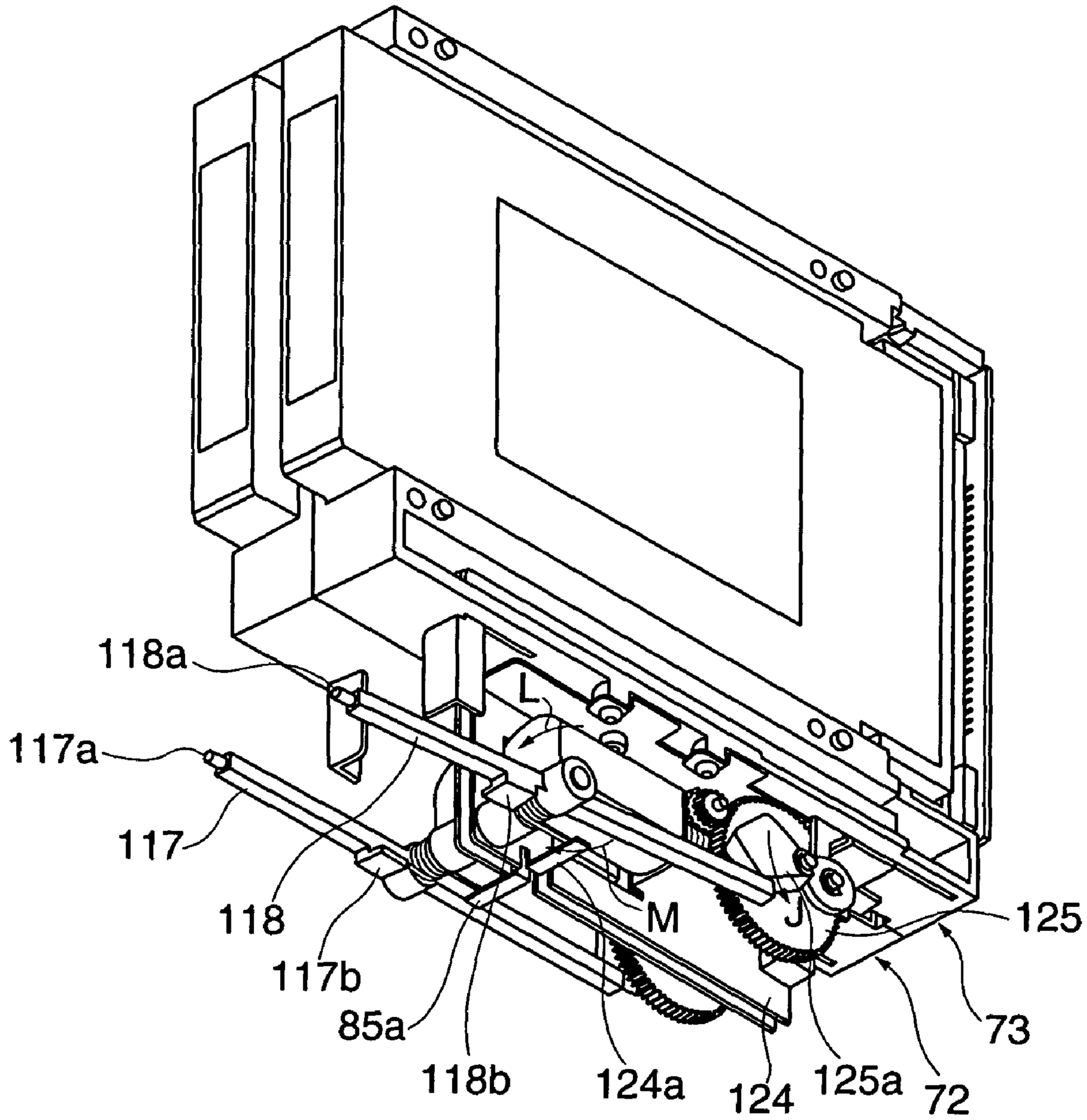


FIG. 45



ELECTRONIC APPARATUS AND INFORMATION PROCESSING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an electronic apparatus and an information processing apparatus which enable a user to easily and safely remove a removable electronic device, such as a modular removable hard disk, from the apparatus or replace such a device with another device.

2. Description of the Related Art

In recent years, with the advent of the Internet and e mails transmitted and received via the Internet, personal computers have become widely diffused at a rapidly increasing rate as a means for accessing the Internet and for transmitting and receiving e mails, as well as a means for sharing information and improving productivity in offices. On the other hand, manufacturers of personal computers have had to manufacture many different models in order to accommodate the diversifying user needs. Furthermore, electronic devices, such as hard disks and CD-ROM drives that are used in personal computers, are upgraded constantly and can quickly become outdated. For these reasons, removable hard disks, which can be removed from personal computers, have been proposed. Furthermore, modular electronic devices have been proposed for use in personal computers, so that the users would be able to easily replace such modular electronic devices.

Such a prior art technology, however, faces a problem. That is, with a modular electronic device such as a hard disk, which is designed to allow a user to easily remove the electronic device from a personal computer and replace it with another electronic device, the user, for example, may inadvertently remove the hard disk from the personal computer while the hard disk is in operation, which may lead to unfavorable results.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an electronic apparatus and an information processing apparatus that can solve the problem with the prior art that a removable electronic device is removed while the removable electronic device is in operation, leading to unfavorable results.

To attain the above object, in a first aspect of the present invention, there is provided an electronic apparatus which comprises a main body, a receiving unit that is removably attached to the main body and receives at least one removable electronic device removably attached thereto, a locking device that locks together the receiving unit and the main body, and a controller that controls the locking device to inhibit the receiving unit and the main body from being released from a state in which they are locked together while the removable electronic device is in operation.

According to this construction, the controller of the electronic apparatus controls the locking device to inhibit the receiving unit and the main body from being locked together while the removable electronic device is in operation. As a result, it is possible to solve the problem with the prior art that a removable electronic device is removed while the removable electronic device is in operation, which leads to unfavorable results. Further, the electronic apparatus according to the first aspect is simple in construction and flexible in function.

Preferably, the electronic apparatus comprises an electronic device removing device that removes the removable electronic device from the receiving unit, and the controller controls the electronic device removing device to inhibit the removable electronic device from being removed from the receiving unit while the removable electronic device is in operation. As a result, the above described effect can be surely and more effectively provided.

Preferably, the electronic apparatus comprises a connector unit provided in the main body, the receiving unit is removably attached to the connector unit, the locking device locks together the receiving unit and the connector unit, and the controller controls the locking device to inhibit the receiving unit from being removed from the connector unit together while the removable electronic device is in operation. As a result, the receiving unit cannot be inadvertently removed from the connector unit.

More preferably, the receiving unit has formed therein at least one recess at such a location that the recess is hidden inside the main body when the receiving unit is attached to the connector unit, and is exposed externally when the receiving unit is removed from the connector unit. As a result, the user can easily carry the receiving unit by hand when the disk unit **5** is removed from the connector unit, thus facilitating handling of the receiving unit.

More preferably, the locking device comprises a locking mechanism that locks together the connector unit and the receiving unit when the receiving unit is attached to the connector unit, the locking mechanism being responsive to a lock release command from the controller, for releasing locking of the connector unit and the receiving unit. As a result, the receiving unit can be prevented from being inadvertently removed from the connector unit in the same manner as described above.

More preferably, the electronic apparatus comprises a unit removing device that is responsive to a removal command from the controller, for removing the receiving unit from the connector unit, when the receiving unit is attached to the connector unit. As a result, the receiving unit can be prevented from being inadvertently removed from the connector unit in the same manner as described above.

Still more preferably, the controller controls the unit removing device to inhibit the receiving unit from being removed from the receiving unit while the removable electronic device is operation. As a result, the receiving unit can be prevented from being inadvertently removed from the connector unit in the same manner as described above.

Still more preferably, the electronic apparatus comprises a single driver that drives the locking device and the unit removing device, that is, a single driver is shared by the locking device and the unit removing device. As a result, the locking device and the ejection device can be realized without increasing the number of component parts.

More preferably, the removable electronic device is configured such that the removable electronic device can be removed from the receiving unit when the receiving unit is removed from the connector unit. As a result, the removable hard disk can be safely exchanged.

More preferably, the removable electronic device comprises a plurality of removable electronic devices of the same type or of different types. As a result, the electronic apparatus according to the first aspect is flexible in function.

Still more preferably, the electronic apparatus comprises a plurality of electronic device removing devices that are provided in association with respective ones of the plurality of removable electronic devices, for removing the respective removable electronic devices from the receiving unit, and

the controller controls any of the removable electronic device removing devices to enable a corresponding one of the removable electronic devices that is not in operation to be removed from the receiving unit. As a result, the removable electronic devices can be safely exchanged.

Still more preferably, the electronic apparatus comprises a display device that displays an indication as to which of the plurality of removable electronic devices attached to the receiving unit has failed in a case where any of the removable electronic devices fails, and the display device continues displaying the indication even after the receiving unit is removed from the connector unit. As a result, the user can immediately determine which of the removable electronic device has failed.

Still more preferably, the electronic apparatus comprises a plurality of electronic device removing devices that are provided in association with respective ones of the plurality of removable electronic devices, for removing the respective removable electronic devices from the receiving unit, and the controller issues a removal command to any of the removable electronic device removing device corresponding to any of the removable electronic devices that has failed, for removing the failed removable electronic device from the receiving unit. As a result, there is no need to manually remove the failed removable hard electronic device, thus improving the usability.

Still more preferably, the electronic apparatus comprises a single driver that drives the removable electronic device removing devices and the display device, that is, a single driver is shared by the removable electronic device removing devices and the display device. As a result, the failure indication for the failed removable electronic device can be realized without increasing the number of component parts.

More preferably, the removable electronic device is positioned such that the outer surfaces thereof lie inwardly of the outer surface of the receiving unit on a side thereof at which the removable electronic devices are attached to the receiving unit. As a result, the user cannot forcibly pull out the removable electronic device to impair the same.

To attain the above object, in a second aspect of the present invention, there is provided an information processing apparatus that comprises the electronic apparatus according to the first aspect.

According to this construction, as is the case with the electronic apparatus according to the first aspect, it is possible to solve the problem with the prior art that a removable electronic device is removed while the removable electronic device is in operation, which leads to unfavorable results. Further, the information processing apparatus according to the second aspect is simple in construction and flexible in function.

The above and other objects, features, and advantages of the invention will become more apparent from the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view showing a personal computer as an information processing apparatus according to a first embodiment of the present invention, as viewed from above to the left on a front side thereof;

FIG. **2** is a perspective view showing the personal computer of FIG. **1**, as viewed from below to the left on the front side thereof;

FIG. **3** is a perspective view showing the personal computer of FIG. **1** from which a removable hard disk on the left hand side has been ejected;

FIG. **4** is a perspective view showing the personal computer of FIG. **1** from which a disk unit has been ejected, as viewed from above to the left on the front side thereof;

FIG. **5** is a perspective view showing the inside of the personal computer of FIG. **1**, as viewed from below to the left on the front side thereof;

FIG. **6** is a perspective view showing the disk unit in FIG. **1** that has been inserted into a unit chassis, as viewed from above to the left on the front side thereof;

FIG. **7** is a perspective view showing the disk unit in FIG. **6**, as viewed from below to the left on a back side thereof;

FIG. **8** is a perspective view showing the disk unit in FIG. **6** from which the unit chassis has been removed, as viewed from above to the left on the front side thereof;

FIG. **9** is a perspective view showing the disk unit in FIG. **7** from which the unit chassis has been removed, as viewed from below to the left on the back side thereof;

FIG. **10** is a top plan view showing the disk unit of FIG. **6** that is joined to a connector unit;

FIG. **11** is a cross sectional view taken along line A—A in FIG. **10**;

FIG. **12** is a top plan view showing the disk unit of FIG. **10** that has been ejected from the connector unit;

FIG. **13** is a cross sectional view taken along line B—B in FIG. **12**;

FIG. **14** is a perspective view showing the disk unit of FIG. **12** that has been ejected from the connector unit, as viewed from above to the left on the back side;

FIG. **15** is a perspective view showing the disk unit of FIG. **12** that has been ejected from the connector unit, as viewed from below to the right on the front side thereof;

FIG. **16** is a perspective view showing the disk unit of FIG. **12** that has been ejected from the connector unit, as viewed from above to the left on a front side thereof;

FIG. **17** is a perspective view showing the disk unit of FIG. **12** that has been ejected from the connector unit, as viewed from below to the right on the back side;

FIG. **18** is an enlarged view showing the connector unit in FIG. **11**;

FIG. **19** is a perspective view showing the connector unit in FIG. **18**, as viewed from below to the left on the front side thereof;

FIG. **20** is a perspective view showing the connector unit in FIG. **18**, as viewed from below to the right on the back side thereof;

FIG. **21** is an enlarged view showing the connector unit in FIG. **13**;

FIG. **22** is a perspective view showing the connector unit of FIG. **21**, as viewed from below to the left on a front side thereof;

FIG. **23** is a perspective view showing the connector unit of FIG. **21**, as viewed from below to the right on a back side thereof;

FIG. **24** is a side view showing the inside of the disk unit of FIG. **6**, as viewed from a right side thereof;

FIG. **25** is a perspective view showing the inside of the disk unit of FIG. **24**, as viewed from below to the left on the back side thereof;

FIG. **26** is a perspective view showing the inside of the disk unit of FIG. **24**, as viewed from above to the left on the front side thereof;

FIG. **27** is a side view of an ejection unit with the removable hard disk of FIG. **3** being attached, as viewed from a left side thereof;

FIG. **28** is a side view showing the ejection unit of FIG. **27** with the removable hard disk being attached, as viewed from a right side thereof;

FIG. **29** is a bottom plan view showing the ejection unit of FIG. **27** with the removable hard disk being attached;

FIG. **30** is a perspective view showing the ejection unit with the removable hard disk of FIG. **27** being attached, as viewed from below to the left on the front side thereof;

FIG. **31** is a side view showing the ejection unit of FIG. **30** with the removable hard disk being ejected, as viewed from a left side thereof;

FIG. **32** is a side view showing the ejection unit of FIG. **30** with the removable hard disk being ejected, as viewed from a right side thereof;

FIG. **33** is a bottom plan view showing the ejection unit of FIG. **30** with the removable hard disk being ejected;

FIG. **34** is a cross sectional view taken along line G—G in FIG. **33**;

FIG. **35** is a perspective view showing the ejection unit of FIG. **30** with the removable hard disk being ejected, as viewed from below to the right on the back side thereof;

FIG. **36** is a side view showing the ejection unit of FIG. **27** with the removable hard disk that has been manually removed, as viewed from a left side thereof;

FIG. **37** is a side view showing the ejection unit of FIG. **27** when the removable hard disk on the left hand side has failed, as viewed from a left side thereof;

FIG. **38** is a side view of the disk unit of FIG. **27** when the removable hard disk on the left hand side has failed, as viewed from a left side thereof;

FIG. **39** is a block diagram schematically showing the electrical configuration of the personal computer of FIG. **1**;

FIG. **40** is a front view schematically showing a disk unit as an electronic apparatus according to a fourth embodiment of the present invention;

FIG. **41** is a perspective view of the disk unit of FIG. **40**, as viewed from above to the left on the front side thereof;

FIG. **42** is a front view showing the internal structure of the disk unit of FIG. **40**;

FIG. **43** is a side view showing the inside of the disk unit of FIG. **42**, as viewed from a left side thereof;

FIG. **44** is a perspective view of the inside of the disk unit of FIG. **43**, as viewed from below to the left on the front side thereof; and

FIG. **45** is a perspective view of the inside of the disk unit of FIG. **43**, as viewed from below to the right on the front side thereof.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will now be described in detail below with reference to the accompanying drawings showing preferred embodiments thereof.

FIG. **1** is a perspective view showing a personal computer **1**, as an information processing apparatus according to a first embodiment of the present invention, as viewed from above to the left on a front side thereof. FIG. **2** is a perspective view showing the personal computer **1** of FIG. **1**, as viewed from below to the left on the front side.

In FIG. **1**, the personal computer **1** has a body thereof covered by a casing **2**, and a disk unit **5** is attached to the personal computer **1** in such a way that the disk unit **5** can be removed. The disk unit **5** can be attached to and removed from the personal computer **1** through a front side thereof. Further, the disk unit **5** is comprised, for example, of two removable hard disks **3**,**3** of an identical model mounted in the body of the disk unit **5** in such a way that the removable hard disks **3**,**3** can be removed. The two removable hard disks **3**,**3** can be attached to and removed from the disk unit **5** through a front side thereof.

Switches **6**,**6** for instructing ejection of the two removable hard disks **3**,**3** are also provided on the front side of the disk unit **5**. Also provided on the front side of the personal computer **1** are a Universal Serial Bus (USB) connector **7**; a PC card slot **9**, into which a PC card **8** is inserted; an IEEE (Institute of Electrical and Electronics Engineers) 1394 connector **10**; a S-video terminal **11**; a video terminal **12**; an audio terminal **14**; a local area network (LAN) connector **15**; a power supply switch **16**, and so forth.

In FIG. **2**, a large recess **17** is formed in a bottom wall of the personal computer **1**. In the recess **17**, there are provided, for example, four LAN connectors **18**, a dual USB connector **13**, and a power supply connector (not shown). Furthermore, a cutout part **19** for allowing cables, such as a power supply cable and a LAN cable, to pass through, is also provided to open into the recess **17**. It should be noted that input devices, such as a keyboard and a mouse for entering data and giving instructions, as well as a display device are also connected to the personal computer **1**, though not shown in FIG. **2**.

FIG. **3** is a perspective view showing the personal computer **1** with the removable hard disk **3** on the left hand side being ejected, out of the two removable hard disks **3**,**3**, that are attached to the disk unit **5**, as shown in FIG. **1** and FIG. **2**. The disk unit **5** includes a mechanism that allows the removable hard disks **3** to be automatically ejected. While only the removable hard disk **3** on the left hand side is ejected in FIG. **3**, the removable hard disk **3** on the right hand side can also be ejected in a similar manner. The mechanism that enables ejection will be described later in detail.

FIG. **4** is a perspective view showing the personal computer **1** with the disk unit **5**, which is shown in FIG. **1** and FIG. **2**, being ejected from the personal computer **1**. As shown in FIG. **4**, the personal computer **1** of the present embodiment enables the user to easily remove the disk unit **5** without using a tool such as a driver, because of an ejection mechanism that will be described later.

FIG. **5** is a perspective view showing the inside of the personal computer of FIG. **1**, as viewed from below to the left on the front side.

In FIG. **5**, the disk unit **5** is inserted into a unit chassis **20**. A power supply **21** is disposed below the disk unit **5**, and a power supply connector **22** is provided on the lower side of the power supply **21**. A battery **23** is also provided on the lower side of the power supply **21**. The various types of connectors, shown in FIG. **1** and FIG. **2**, are soldered to a motherboard **24** inside the personal computer **1**. Various types of expansion boards **25** are also connected to the motherboard **24**. It should be noted that the unit chassis **20**, the power supply **21**, the battery **23**, the motherboard **24**, and the like are fixed to, for example, a chassis, not shown in FIG. **5**.

Next, the disk unit **5** and a connector unit **28** will be described next.

FIG. **6** is a perspective view of the disk unit **5** in FIG. **1**, which is inserted into the unit chassis **20**, as viewed from above to the left on the front side thereof. FIG. **7** is a perspective view of the disk unit **5** in FIG. **6**, as viewed from below to the left on a back side thereof. In FIGS. **6** and **7**, each of the top and bottom side surfaces of the unit chassis **20** has formed therein, for example, four screw holes **26** for securing the unit chassis **20** to the main chassis of the personal computer **1**. Furthermore, screws **27** are fitted in

both the top side surface and the bottom side surface of the unit chassis **20**, to secure the connector unit **28**, which will be described later, to the unit chassis **20**.

FIG. **8** and FIG. **9** are perspective views of the disk unit **5**, with the unit chassis **20** removed from the disk unit **5**, as shown in FIG. **6** and FIG. **7**. In FIG. **8** and FIG. **9**, the disk unit **5** is connected to the connector unit **28** on the main body of the personal computer **1**. The left and right side surfaces, as well as the back side surface of the disk unit **5**, are covered by cover members **30**, **31**, while the front side is covered by a front cover member **32**. The cover member **30** has a recess **33** formed therein, while the cover member **31** has a recess **34** formed therein. With this configuration, the user can easily carry the disk unit **5** by hand when removed from the personal computer **1**. Further, the cover member **31** has recesses **41** formed therein at, for example, four locations. Four screws **40** in the recesses **41** secure an ejection unit of the removable hard disk **3**, which will be described later, to the cover member **31**. Furthermore, the cover members **30**, **31** for the disk unit **5** also has formed therein ejection holes **35**, **36**, as well as failure indicator holes **37**, **38**. Functions provided by these holes will be described later.

The connector unit **28** is covered by a cover member **43** and a base **44**, and a connector **45** is exposed on the back side surface of the connector unit **28**. The connector **45** is electrically connected to the motherboard **24** (see FIG. **5**) with a connector cable, not shown. Screw holes **46** are formed in both the top side surface and the bottom side surface of the cover member **43** for the connector unit **28**. As shown in FIGS. **6** and **7**, the connector unit **28** is secured to the unit chassis **25** by the screws **27** fitted into the screw holes **46**. Further, a square hole **47** is formed in each of the top side surface and the bottom side surface of the cover member **43**, in which is fitted a claw **48** which is formed integrally with the base **44**.

Thus, the personal computer **1** of the present embodiment is comprised of the connector unit **28**, which is secured to the main body of the personal computer **1**, and the disk unit **5**, which can be removed from the main body of the personal computer **1**. The connector unit **28** and the disk unit **5** can be electrically connected to each other, and the disk unit **5** can be electrically connected to the removable hard disk **3**, which can be removed. The personal computer **1** is configured such that the disk unit **5** cannot be removed from the connector unit **28** while either of the removable hard disks **3** is in operation, and either of the removable hard disks **3**, while in operation, cannot be removed from the disk unit **5**.

Next, a locking mechanism and an ejection mechanism for the disk unit **5** will be described.

FIG. **10** is a top plan view of the disk unit **5** of FIG. **6** in a state connected to the connector unit **28**, while FIG. **11** shows a cross sectional view taken along line A—A in FIG. **10**. Further, FIG. **12** through FIG. **17** show the disk unit **5** of FIG. **10** ejected from the connector unit **28** as shown in FIG. **4**, as viewed from various directions. FIG. **12** is a top plan view showing the disk unit **5** of FIG. **10** ejected from connector unit **28**, while FIG. **13** shows a cross sectional view taken along line B—B in FIG. **12**. FIG. **14** is a perspective view of the ejected disk unit **5** of FIG. **12**, as viewed from above to the left on the back side of the connector unit **28**. FIG. **15** is a perspective view of the ejected disk unit **5** of FIG. **12**, as viewed from below to the right on the front side thereof. FIG. **16** is a perspective view of the ejected disk unit **5** of FIG. **12**, as viewed from above to the left on the front side thereof. FIG. **17** is a perspective view of the ejected disk unit **5** of FIG. **12**, as viewed from below to the right on the back side of the connector unit **28**.

First, the outlines of the locking mechanism and the ejection mechanism for the disk unit **5** will be described. In FIGS. **10** and **11**, an ejection lever **51** for ejecting the disk unit **5** from the main body of the personal computer **1** is seen to be in a receded position as a non-ejection position within the connector unit **28**. The ejection lever **51** is rotatably fitted on a fulcrum shaft **56**, as shown in FIGS. **18** to **20**, referred to hereinafter. A locking claw **52** is seen to be hooked in a square hole **68** formed in the cover member **31** of the disk unit **5** as shown in FIG. **14** to lock the disk unit **5** to the connector unit **28**. The locking claw **52** is also rotatably fitted on the fulcrum shaft **56** together with the ejection lever **51**. Furthermore, a connector **50** on the connector unit **28** is in a state being electrically connected to a connector **55** on the disk unit **5**.

As shown in FIGS. **12** and **13**, when the locking claw **52** rotates slightly in a direction indicated by the arrow K about the fulcrum shaft **56**, the locking claw **52** disengages from the square hole **68** in the cover member **31** so that the disk unit **5** is unlocked from the connector unit **28**. At the same time, the ejection lever **51** rotates slightly about the fulcrum shaft in the direction indicated by the arrow K to springout of a square hole **53** formed in the connector unit **28**, as shown in FIG. **15** and FIG. **16** and push the cover member **31** of the disk unit **5**, to thereby cause the disk unit **5** to be ejected from the main body of the personal computer **1**, as shown in FIG. **14** and FIG. **17**. Of course, the connector **50** and the connector **55** become disconnected at the same time. As is clear from the description so far given, the major parts of the locking mechanism and the ejection mechanism for the disk unit **5** are provided on the side of the connector unit **28**. As a result, the disk unit **5** is prevented from being inadvertently pulled out.

Next, the locking mechanism and the ejection mechanism for the disk unit **5** will be described in detail. In FIGS. **11** and **13**, the fulcrum shaft, and a fulcrum shaft **57**, and a fulcrum shaft **58** are calked to the cover member **43**, and a switch **61** is secured to the cover member **43** by means of a screw **62**. A motor **59** is secured to a raised bent part **69** of the cover member **43** by screws **60**. Further, a stopper **29** is formed integrally on the cover member **43**, and a torsional coil spring **63** has one end thereof supported by the stopper **29**.

FIG. **18** through FIG. **23** show the connector unit **28** with the cover member **43** removed. FIG. **18** shows an enlarged view of the connector unit **28**, which is shown in FIG. **11**. FIG. **19** is a perspective view showing the connector unit **28** of FIG. **18**, as viewed from below to the left on the front side thereof, while FIG. **20** is a perspective view showing the connector unit **28** of FIG. **18**, as viewed from below to the right on the back side thereof.

In FIGS. **18** to **20**, the connector **55** and the connector **45** of the connector unit **28** are soldered to a sub substrate **70**, and the sub substrate **70** is secured to the base **44** by screws **71**. The motor **59** is electrically connected to the base **44** by lead wires, not shown. Furthermore, a worm gear **64** is press fitted into the body of the motor **59**. The worm gear **64** meshes with one of gears that constitute a two-stage gear **65** that is rotatably fitted on the fulcrum shaft **58**. The other gear of the two-stage gear **65** meshes with a gear **66**, which is fitted on the fulcrum shaft **57**. The gear **66** is formed integrally with a cam **66***a*, a cam **66***b* and a cam **66***c*. The switch **61** is electrically connected to the sub substrate **70** by lead wires, not shown. The switch **61** has a push button **61***a* which is urged by a projecting part of the cam **66***c* to be held ON.

The torsional coil spring **63** is disposed relative to the locking claw **52** such that one end of the spring **63** is

supported by a projection **52***a* on the locking claw **52**, while the other end of the spring **63** is supported by the stopper **29** provided on the cover member **43** (see FIG. **11**). With this arrangement, the locking claw **52** receives a force in a direction indicated by an arrow C about the fulcrum shaft **56** and swings about the shaft **56** as the cam **66***b* rotates to cause the ejection lever **51** to come into alternate contact with the projecting part and a non-projecting part of the cam **66***b*. When the disk unit **5** is inserted into the connector unit **28**, a slanted face part **52***b* of the locking claw **52** is pushed by a marginal edge **68***a* of the square hole **68** in the disk unit **5**, which is shown in FIG. **14**, so that the locking claw **52** swings in the direction indicated by the arrow K. When the coupling of the disk unit **5** with the connector unit **28** is completed, the tilted part **52***b* goes into the square hole **68**, and the locking claw **52** rotates in a direction indicated by the arrow C to bring the disk unit **5** and the connector unit **28** into a locked state.

The ejection lever **51** is mounted on the fulcrum shaft, and one end **51***a* of the ejection lever **51** urges a rear end surface of the cover member **31** of the disk unit **5** when the disk unit **5** is ejected, as mentioned earlier (see FIG. **13**). The other end of the ejection lever **51** is in contact with the cam **66***a* and swings as the cam **66***a* rotates to cause the other end of the ejection lever **51** to come into alternate contact with the projecting part and non-projecting part of the cam **66***a*. In the present embodiment, the ejection lever **51** rotates in the direction indicated by the arrow K and ejects the disk unit **5**, when the projecting part of the cam **66***a* is in contact with the other end of the ejection lever **51**.

FIG. **21** through FIG. **23** are diagrams showing the internal construction of the connector unit **28** in FIG. **13** in a state when the disk unit **5** is ejected. FIG. **21** is an enlarged view of the connector unit **28**, shown in FIG. **13**. FIG. **22** is a perspective view showing the connector unit **28**, as viewed from below to the left on a front side thereof. FIG. **23** is a perspective view showing the connector unit **28**, as viewed from below to the right on a rear side thereof.

In FIGS. **21** to **23**, the gear **66** is in a position where it has rotated by 180 degrees in a direction indicated by an arrow D from the position shown in FIG. **18**. In this state, the push button **61***a* of the switch **61** is not in contact with the projecting part of the cam **66***c* and thus is projected, and hence the switch **61** is OFF. Further, a base end of the locking claw **52** is in contact with the projecting part of the cam **66***b*, and hence the locking claw **52** is in an unlocked state where it has rotated in the direction indicated by the arrow K. Further, the ejection lever **51** is in contact with the projecting part of the cam **66***a* and has rotated in the direction indicated by the arrow K into a position for ejecting the disk unit **5**.

In an actual operation, when an ejection command for the disk unit **5** (to release the lock) is issued, the motor **59** is rotated in such a direction that the gear **66** rotates in the direction indicated by the arrow D from the position shown in FIG. **18**, whereby the switch **61** is first turned off, and the locking claw **52** rotates in the direction indicated by the arrow K from the position shown in FIG. **18** to bring the disk unit **5** into an unlocked state. Then, the ejection lever **51** rotates in the direction indicated by the arrow K from the position shown in FIG. **18** to eject the disk unit **5**. After the ejection, the motor **59** continues to rotate to cause the locking claw **52** to rotate in the direction indicated by the arrow C into the initial position. Thereafter, the switch **61** is turned on, and the motor **59** stops. The ejection operation for the disk unit **5** is thus completed. At this time, the ejection lever **51** is in the position corresponding to the disk unit **5** having been ejected. However, since the ejection lever **51** is in a position corresponding to the non-projecting part of the cam **66***a*, the ejection lever **51** is stored back into the connector unit **28** when the disk unit **5** is again connected to the connector unit **28**.

It should be noted that the ejection command to eject the disk unit **5** is issued by a CPU**110** of the personal computer **1**, after the CPU**110** determines that the two removable hard disks **3** in the disk unit **5** are not being accessed. Therefore, even if the user tries to eject the disk unit **5** by manipulating the input device for the personal computer **1**, such as the keyboard, the disk unit **5** is not ejected, when either one of the two removable hard disks **3** is being accessed.

Next, the outlines of the internal construction of the disk unit **5** of FIG. **6**, which accommodates 2.5-inch disks, and the ejection mechanism for the removable hard disk **3** will be described. FIGS. **24** to **26** are views showing the internal construction of the disk unit **5** of FIG. **6**. FIG. **24** is a side view of the disk unit **5** of FIG. **6**, as viewed from a right side thereof, while FIG. **25** is a perspective view of the disk unit **5** of FIG. **24**, as viewed from below and to the left on the back side thereof. FIG. **26** is a perspective view of the disk unit **5** of FIG. **24**, as viewed from above to the left on the front side.

In FIGS. **24** to **26**, reference numerals **72** and **73** designate ejection units for ejecting the two removable hard disks **3**, respectively, from within the disk unit **5** and are almost symmetrical in shape. The ejection units **72** and **73** are secured to the cover member **31** by the four screws **40** shown in FIG. **9** referred to before. Further, connectors **75**, **76** are secured to the ejection units **72** and **73**, respectively, and the connectors **75**, **76** are soldered to a flexible printed circuit board **74**. The connectors **75**, **76** are electrically connected to connectors **3***a* of the removable hard disks **3**. A connector **55** is also soldered to the flexible printed circuit board **74**, and the connector **55** is secured to the cover member **31** by screws **77**, as shown in FIG. **17**, referred to before.

Reference numerals **78**, **79** designate driver units for ejecting the two removable hard disks **3** and correspond to the ejection units **72**, **73**, respectively. A motor **80** and a switch **82**, and a motor **81** and a switch **83** are provided for the driver unit **78** and the driver unit **79**, respectively, and are electrically connected to the flexible printed circuit board **74** by lead wires, not shown. Further, the switch **6**, shown in FIG. **1** and FIG. **2**, for instructing the ejection of the removable hard disk **3** is also electrically connected to the flexible printed circuit board **74** by lead wires, not shown.

Next, the ejection mechanism for the removable hard disks **3** will be described in detail. As mentioned above, the ejection units **72** and **73** are almost symmetrical in shape. Therefore, the construction and operation will be described referring to the ejection unit **72** on the left hand side in FIG. **26** as an example.

FIGS. **27** to **30** show the removable hard disk **3** that is attached to the ejection unit **72** of FIG. **3**. FIG. **27** is a side view of the ejection unit **72** of FIG. **3** with the removable hard disk **3** attached thereto, as viewed from the left side thereof, while FIG. **28** is a side view of the ejection unit **72** of FIG. **27** with the removable hard disk **3** attached thereto, as viewed from the right side thereof. FIG. **29** is a bottom plan view of the ejection unit **72** of FIG. **27** with the removable hard disk **3** attached thereto, while FIG. **30** is a perspective view of the ejection unit **72** of FIG. **27** with the removable hard disk **3** attached thereto, as viewed from below to the left on the front side thereof.

In FIGS. **27** to **30**, the driver unit **78** has a base **85** secured to a socket **87** on which the removable hard disk **3** is

mounted by screws **86**. A switch **89** is secured to the base **85** by a screw **90**, and the motor **80** is secured to the base **85** by screws **91**. The motor **80** is composed of a pulse motor. A fulcrum shaft **85***a* and a fulcrum shaft **88** are also secured to the base **85**. A worm gear **92** is press fitted into the body of the motor **80**, and the worm gear **92** meshes with a gear **93**, which is rotatably fitted on the fulcrum shaft **85***a*.

The gear **93** is a two-stage gear. A gear of the two-stage gear **93** that does not mesh with the worm gear **92** meshes with a gear **94** rotatably fitted on the fulcrum shaft **88**. Cams **94***a* and **94***b* are disposed on both sides of the gear **94** and restrained from moving in a thrust direction by an E ring **98**. It should be noted that in FIG. **29**, the cam **94***b* is in a position in which a projecting part thereof urges a push button **89***a* of the switch **89** to hold the switch **89** ON.

A lever **97** is disposed in a space at a lower part of the socket **87** and is movable along, for example, grooves **87***a*, **87***b* formed in a bottom surface of the lower part of the socket **87**. A fulcrum shaft **96** is secured to a projecting part of the lever **97**. A roller **95** is rotatably fitted on the fulcrum shaft **96**. The roller **95** is restrained from moving in a thrust direction by an E ring **99**. The roller **95** is disposed in contact with a cam surface of the cam **94***a*, and the lever **97** is moved as the cam **94***a* rotates to cause the roller **95** to come into alternate contact with a projecting part and a non-projecting part of the cam **94***a*. As shown in FIG. **28**, the lever **97** has a raised bent part **97***a*, into which is inserted one end of a spring **108**. The other end of the spring **108** is fitted on a shaft **87***c* provided on the socket **87**. With this arrangement, the roller **95** is always in urging contact with the cam surface of the cam **94***a*.

As shown in FIG. **28**, a fulcrum shaft **100** is press fitted into the socket **87**, and an arm **101** is fitted on the fulcrum shaft **100**. The E ring **199** is fitted on the fulcrum shaft **100** to keep the arm **101** from falling off. A projection **101***a* is formed on one end of the arm **101** and is engaged in a recess **97***c* formed in the lever **97**. An ejection member **102** is moveable in a direction indicated by an arrow E along a groove formed in the socket **87**, not shown. A cam surface **101***b* of the arm **101** is disposed in contact with a bent part **102***a* of the ejection member **102**. The ejection member **102** moves in the direction indicated by the arrow E as the arm **101** rotates in a direction indicated by an arrow F.

Next, the ejection operation of the removable hard disk **3** will be described.

FIGS. **31** to **35** show the ejection unit **72** with the removable hard disk **3** ejected therefrom. FIG. **31** is a side view of the ejection unit **72** of FIG. **30** with the removable hard disk **3** that has been ejected, as viewed from a left side thereof, while FIG. **32** is a side view of the ejection unit **72** with the removable hard disk **3** that has been ejected, as viewed from a right side thereof. FIG. **33** is a bottom plan view of the ejection unit **72** with the removable hard disk **3** that has been ejected, while FIG. **34** is a cross sectional view taken along line G—G in FIG. **33**. FIG. **35** is a perspective view of the ejection unit **72** with the removable hard disk **3** that has been ejected, as viewed from below to the right on a back side thereof.

As shown in FIGS. **31** to **35**, the gear **94** rotates by 180 degrees with a rotation of the motor **80**, and the cam **94***a* urgingly displaces the roller **95** and accordingly the lever **97** also is urged to be displaced. Consequently, the projection **101***a* of the arm **101**, which is engaged in the recess **97***c* of the lever **97**, is also urged to be displaced, so that the arm **101** rotates in the direction indicated by the arrow F to make the ejection member **102** move in the direction indicated by the arrow E, whereby the bent part **102***a* of the ejection member **102** makes an urging action on the removable hard disk **3** to eject the same. As shown in FIGS. **33** and **34**, the switch **89** is OFF at this time.

In an actual operation, when the CPU**110** (see FIG. **39**) of the personal computer **1** issues an ejection instruction for ejecting, for example, the removable hard disk **3** on the left hand side, out of the two removable hard disks **3**,**3** that are attached to the disk unit **5**, the gear **94** is rotated by 180 degrees, then further continue to rotate without stopping, and stops after a predetermined amount of rotation after the switch **89** is turned on, thus completing a sequence of operations.

The ejection instruction for the removable hard disk **3** on the left hand side by the CPU**110** of the personal computer **1** is issued when the CPU**110** determines that the removable hard disk **3** on the left hand side is not being accessed. Therefore, while the removable hard disk **3** on the left hand side is being accessed, the user is not able to automatically eject the removable hard disk **3** on the left hand side from the disk unit **5** by manipulating the input device, such as the keyboard for the personal computer **1**, or by pressing the switch **6** on the front side of the disk unit **5**. Similarly, the user is not be able to automatically eject the removable hard disk **3** on the right hand side, while it is being accessed.

Furthermore, as shown in FIGS. **1** and **2**, the user cannot forcibly pull out the removable hard disk **3** from the disk unit **5** when the disk unit **5** is attached to the personal computer **1**, because the removable hard disk **3**, when attached to the disk unit **5**, is positioned such that its outer surface lies inwardly of the outer surface of the front cover member **32** of the disk unit **5**. In the present embodiment, however, the disk unit **5** is configured such that the removable hard disk **3**, when attached to the disk unit **5**, can be manually ejected from the disk unit **5** when the disk unit **5** is removed from the personal computer **1**. A mechanism for performing this will be described next.

FIG. **36** is a side view of the ejection unit **72** of FIG. **27** with the removable hard disk **3** manually removed from the disk unit **5**, as viewed from a left side thereof. As shown in FIGS. **27** and **31**, the lever **97** normally moves as it comes into alternate contact with the projecting part and the non-projecting part of the cam **94***a* as the cam **94***a* rotates. When a force is applied to the lever **97** in a direction for compressing the spring **108** while the lever **97** is moving from a position shown in FIG. **28** to a position shown in FIG. **32**, the lever **97** can be moved in a direction indicated by an arrow H in FIG. **36**. When a bent part **97***b*, which is formed integrally on the lever **97**, is pushed in the direction indicated by the arrow H from the position shown in FIG. **27** into the position shown in FIG. **36**, the removable hard disk **3** is ejected.

On the other hand, as shown in FIGS. **8**, **9**, **13**, the ejection holes **35** and **36** are formed in the cover member **30** and the cover member **31** of the disk unit **5** at positions corresponding to the bent part **97***b* of the lever **97**. Therefore, when the disk unit **5** is removed from the personal computer **1**, then the removable hard disk **3** can be manually ejected from the disk unit **5** by pressing the bent part **97***b* through the ejection holes **35** and **36** in the direction for compressing the spring **108**.

Further, when the disk unit **5** is thus removed from the personal computer **1**, the removable hard disk **3** is shut off from electric connection to the personal computer **1**, and therefore the removable hard disk **3** can be safely ejected from the disk unit **5**. Furthermore, even in the event that the removable hard disk **3** cannot be automatically ejected from the disk unit **5** due to some failure, the removable hard disk

3 can still be manually ejected from the disk unit 5 by first removing the disk unit 5 from the personal computer 1.

According to the present embodiment, as mentioned before, two removable hard disks 3 can be loaded into the disk unit 5. In the case where one of the removable hard disks 3 fails, the user can find out which of the removable hard disks 3 has failed by looking at the display device, such as a CRT display, provided for the personal computer 1, which may indicate, for example, a "C drive failure," or a "D drive failure." However, the user may not be able to easily determine which of the two removable hard disks 3 is the C drive, and which is the D drive, when attempting to replace the failed removable hard disk 3. To address this issue, the present embodiment provides a means for displaying which of the two removable hard disks 3 has failed, as described below, with only a negligible additional cost.

Next, an operation that takes place when, for example, the removable hard disk 3 on the left hand side fails, will be described.

FIG. 37 is a side view of the ejection unit 72 of FIG. 27, as viewed from a left side thereof when the removable hard disk 3 on the left hand side has failed. FIG. 38 shows a side view of the disk unit 5 of FIG. 27, as viewed from a left side thereof when the removable disk drive 3 on the left hand side has failed.

When the removable hard disk 3 on the left hand side fails, the CPU110 (see FIG. 39) of the personal computer 1 detects the failure, and issues a rotation instruction to the motor 80 to rotate the gear 94 by 45 degrees in a direction indicated by an arrow J. The gear 94 is rotated by 45 degrees with the rotation of the motor 80, into a position as shown in FIG. 37. In FIG. 37, a cylindrical projecting part 94*c* is formed on a surface of the cam 94*a*, which has a surface thereof formed with saw-toothed indentations. FIG. 38 shows the disk unit 5 with the ejection unit 72 being in the condition shown in FIG. 37, in which the projecting part 94*c* is seen through the failure indicator hole 37. That is, because the projecting part 94*c* being seen through the failure indicator hole 37, the user knows that it is the removable hard disk 3 on the left hand side that has failed.

Further, when the removable hard disk 3 on the left hand side fails, the CPU110 of the personal computer 1 issues an ejection instruction. In other words, the ejection command is a command for rotating the motor 80 until the removable hard disk 3 is ejected from the disk unit 5. Specifically, the CPU controls the motor 80 to further rotate by 135 degrees in the direction indicated by the arrow J from the position into which the gear 94 has been rotated by 45 degrees, to bring the removable hard disk 3 into a position shown in FIG. 31. Thus, upon issuance of the ejection command, the removable hard disk 3 is automatically ejected from the ejection unit 72 in the disk unit 5.

While the failure indication for the removable hard disk 3 on the left hand side has been described in the present embodiment, the same structural means is provided for the failure indication for the removable hard disk 3 on the right hand side. As shown in FIG. 9, for example, an identical failure indicator hole 38 is also formed in the right side surface of the disk unit 5. As shown in FIG. 25, for example, an identical projecting part 94*c* is also provided on the side of the ejector unit 73. Therefore, the user can instantly determine which of the removable hard disks 3 has failed by looking at the failure indicator holes 37 and 38 on both sides of the disk unit 5. While the surface of the projecting part 94*c* has saw-toothed indentations in the present embodiment, the surface of the projecting part 94*c* may be colored in a loud color or may have applied thereon a sticker with a loud color.

Next, the outlines of the electrical configuration of the personal computer 1 will be described by referring to FIG. 39 which is a block diagram schematically showing the electrical configuration of the personal computer 1 of FIG. 1.

The personal computer 1 includes the power supply 21, the battery 23, the motherboard 24, the connector unit 28, the disk unit 5, the input device, not shown, that includes the keyboard and the mouse, and the display device (not shown).

The motherboard 24 includes the CPU110 and a ROM111. The connector unit 28 is comprised of the motor 59, the switch 61, and the sub substrate 70. The disk unit 5 is comprised of the flexible printed circuit board 74, the ejection unit 72 on the left hand side, which includes the motor 80 and the switch 82 and is used for ejecting the removable hard disk 3 on the left hand side, the ejection unit 73 on the right hand side, which includes the motor 81 and the switch 83 and is used for ejecting the removable hard disk 3 on the right hand side, the switch 6 for the removable hard disk on the left hand side, and the switch 6 for the removable hard disk on the right hand side.

The power supply 21 supplies power to the motherboard 24 and the battery 23. The battery 23 is a so-called uninterruptible power supply, that is capable of temporarily supplying power to the motherboard 24 when there is a power failure or when the power supply plug of the personal computer 1 is pulled out of a socket, while the personal computer 1 is in operation. By using the battery 23 of this type, even if there is a power failure while the personal computer 1 is in operation, the personal computer 1 does not stop operating until after a normal process has been completed. Consequently, a power failure does not result in, for example, destruction or loss of data.

The CPU110 on the motherboard 24 operates as the brain of the personal computer 1 to make various determinations. Further, the CPU110 controls the ejection of the disk unit 5 from the connector unit 28 as well as the ejection of the removable hard disks 3 from the disk unit 5 by issuing ejection commands. The CPU110 performs writing data to and reading data from the removable hard disks 3. Furthermore, in the present embodiment, an operating apparatus (OS) is stored in the ROM111 on the motherboard 24 so that various processes can be performed even when the removable hard disks 3 are removed from the disk unit 5.

The sub substrate 70 in the connector unit 28 receives power supplied from the motherboard 24 and exchanges data with the motherboard 24. Further, the motor 59, as a driver for ejecting the disk unit 5 from the personal computer 1, and the switch 61 for controlling the rotation of the motor 59 are connected to the sub substrate 70.

The flexible printed circuit board 74 in the disk unit 5 receives power supplied from the sub substrate 70 and exchanges data with the sub substrate 70. The two removable hard disks 3, as removable electronic devices, and the motor 80, the motor 81, the switch 82, and the switch 83, which are for ejecting the removable hard disks 3, are connected to the flexible printed circuit board 74. Further, the switches 6, 6 for instructing the ejection of the two removable hard disks 3 are also connected to the flexible printed circuit board 74.

With the above arrangement, the CPU110 of the personal computer 1 issues a lock release command for releasing the lock between the disk unit 5 and the connector unit 28,

removal commands for removing the disk unit **5** from the connector unit **28** and for removing the removable hard disk **3** from the disk unit **5**, controls the operation of the motor **59**, which drives the locking mechanism and the ejection mechanism for the disk unit **5**, as well as the motor **80** and the motor **81**, which drive the ejection units **72**, **73**, respectively, for the two removable hard disks **3**, **3**, respectively, and writes and reads data to and from the removable hard disks **3**.

As described above, the information processing apparatus of the present embodiment is comprised of the internal connector unit **28** provided in a personal computer **1**, and the disk unit **5**, which can be removably attached to the connector unit **28** and is electrically connected to the connector unit **28** when attached to the connector unit **28**, the disk unit **5** being configured such that the removable hard disks **3** can be removably attached to the disk unit **5** and are electrically connected with the disk unit **5** when the removable hard disks **3** are attached to the disk unit **5**. When the disk unit **5** is attached to the connector unit **28**, and the removable hard disks **3** are attached to the disk unit **5**, the disk unit **5** cannot be removed from the connector unit **28**, and the removable hard disks **3** cannot be removed from the disk unit **5**, while the removable hard disks **3** are in operation. As a result, it is possible to solve the problem with the prior art that one or both of the removable hard disks are removed while the removable hard disks are in operation, which leads to unfavorable results. Further, the information processing apparatus according to the present embodiment is simple in construction and flexible in function.

Furthermore, the removable hard disks **3** can be removed from the disk unit **5** when the disk unit **5** is removed from the connector unit **28**, and hence the removable hard disks **3** can be safely exchanged.

Furthermore, the disk unit **5** remains hidden inside the personal computer **1** when the disk unit **5** is attached to the connector unit **28**. Besides, when the disk unit **5** is removed from the connector unit **28**, the recesses **33** and **34** become exposed externally on the disk unit **5**, so that the user can easily carry the disk unit **5** by hand when the disk unit **5** is removed from the connector unit **28**, thus facilitating handling of the disk unit **5**.

Moreover, the locking mechanism (the locking claw **52** of the connector unit **28** and the square hole **68** of the disk unit **5**) locks together the connector unit **28** and the disk unit **5** when the disk unit **5** is attached to the connector unit **28**, and releases the lock when an ejection command for releasing the lock is issued. As a result, the disk unit **5** cannot be inadvertently removed from the connector unit **28**.

Still further, the ejection mechanism (the ejection lever **51** on the connector unit **28**), for ejecting the disk unit **5** from the connector unit **28** when an ejection command is issued with the disk unit **5** attached to the connector unit **28**, can prevent the disk unit **5** from being inadvertently removed from the connector unit **28** in a similar manner as the locking mechanism described above.

Furthermore, the locking mechanism for locking the disk unit **5** with the connector unit **28** and the ejection mechanism for ejecting the disk unit **5** are driven by a single driver (the motor **59** of the connector unit **28**). As a result, the locking mechanism and the ejection mechanism can be realized without increasing the number of component parts.

Further, the disk unit **5** can accommodate a plurality of removable hard disks **3**, and thus the personal computer **1** is flexible in function.

Furthermore, out of the plurality of removable hard disks **3** that are attached to the disk unit **5**, the removable hard disk **3** that is not in operation can be removed, and hence the removable hard disk **3** can be safely exchanged.

Still further, the disk unit **5** includes the display means (the failure indicator holes **37**, **38** and the projecting parts **94***c*) for indicating which of the removable hard disks **3** has failed, and the display means retains the failure indication even when the disk unit **5** has been removed from the connector unit **28**, when one of the plurality of removable hard disks **3** which are attached to the disk unit **5** fails. As a result, the user can immediately determine which of the removable hard disks **3** has failed.

Still further, the second drivers (the motor **80** and the motor **81**) for driving the ejection units **72**, **73**, respectively, for ejecting the respective removable hard disks **3**, are also provided for controlling the failure display means described above. As a result, the failure indication for the removable hard disks **3** can be carried out without increasing the number of component parts.

Further, the removable hard disks **3** are positioned with their outer surfaces thereof lying inwardly of the outer surface of the disk unit **5** to which the removable hard disks **3** are attached. As a result, the user cannot forcibly pull out the removable hard disks **3** to impair the same.

While in the first embodiment described above, the failure of the removable hard disk **3** is addressed by indicating the failure through the failure indicator holes **37**, **38** in the disk unit **5**, the method of addressing the failure is not limited to such a method.

A second embodiment of the present invention will be described next.

According to the present embodiment, when the CPU**110** of the personal computer **1** detects a failure in either of the removable hard disks **3**, then the CPU**110** issues an ejection command for ejecting the failed removable hard disk **3**, so that the actually failed removable hard disk **3** is ejected by the ejection mechanism.

More specifically, the disk unit **5** includes the ejection mechanisms (the ejection units **72** and **73**) for ejecting the removable hard disks **3** corresponding to the respective ejection mechanisms from the disk unit **5**. When one of the plurality of removable hard disks **3** fails, the ejection unit corresponding to the failed removable hard disk **3** ejects the failed removable hard disk **3** from the disk unit **5** upon issuance of an ejection command. As a result, there is no need to manually remove the failed removable hard disk **3**, thus improving the usability.

Next, a third embodiment of the present invention will be described. While the disk unit **5** in the first embodiment has a structure for allowing two removable hard disks **3** to be attached thereto.

The number of removable hard disks **3** that can be attached is not limited to two. Instead, the disk unit **5** can accommodate any number of removable hard disks **3**. Further, the electronic device that can be attached to or removed from the disk unit **5** is not limited to the removable hard disk and may include, for example, a CD-RW unit or a DVD unit or any combination of such.

Next, a fourth embodiment of the present invention will be described. In the first embodiment, as shown in FIG. **37** and FIG. **38**, when the removable hard disk **3** fails, the cam **94***a* corresponding to the failed removable hard disk **3** is rotated by 45 degrees in the direction indicated by the arrow J, so that the failure of that particular removable hard disk **3** is confirmed through the failure indicator hole **37** in the disk unit **5**. The present embodiment, on the other hand, provides a structure for enabling confirmation of the failure on the front side of the disk unit **5**.

FIGS. **40** and **41** schematically show the disk unit **5** as an electronic apparatus of the present embodiment. FIG. **40** is a front view showing the disk unit **5** as the electronic apparatus of the present embodiment, while FIG. **41** is a perspective view showing the disk unit **5** of FIG. **40**, as viewed from above to the left on the front side thereof. Further, FIGS. **42** through **45** are diagrams showing the internal structure of the disk unit **5** of FIG. **40**. FIG. **42** is a front view showing the internal structure of the disk unit **5** of FIG. **40**, while FIG. **43** is a side view showing the inside of the disk unit **5** of FIG. **42**, as viewed from the left side thereof. FIG. **44** is a perspective view showing the inside of the disk unit **5** of FIG. **43**, as viewed from below to the left on the front side thereof, while FIG. **45** is a perspective view showing the inside of the disk unit **5** of FIG. **43**, as viewed from below to the right on the front side thereof.

Elements and parts in FIG. **40** through FIG. **45**, that are similar to those of the first embodiment described before, are designated by identical reference numerals.

As shown in FIGS. **40** and **41**, the front cover member **32** of the disk unit **5** has formed therein failure indicator holes **115** and **116**, which correspond to the two removable hard disks **3**, respectively. In the illustrated example, the removable hard disk **3** on the left hand side has failed. As shown in FIG. **40**, a circular projection **117***a* is seen through the failure indicator hole **115** on the left hand side.

Next, the internal construction of the disk unit **5** will be described. Since the ejection units **72**, **73** of the right and the left of the disk unit **5** are mostly symmetrical in shape, the following description refers mainly to the ejection unit **72** on the left hand side.

As shown in FIG. **42** through FIG. **45**, a fulcrum shaft **122** is secured to the base **85** of the ejection unit **72** on the left hand side. A lever **117** is rotatably fitted on the fulcrum shaft **122**, and the lever **117** has a tip end thereof formed with a cylindrical projection **117***a*.

Further fitted on the fulcrum shaft **122** is a spring **120**, which has an end thereof supported by a raised bent part **85***a* of the base **85** and the other end thereof supported by the projection **117***b* of the lever **117**. Consequently, the lever **117** receives a force in a direction indicated by an arrow L. Furthermore, a base end of the lever **117** is disposed in contact with the cam **94***a*. When the cam **94***a* rotates as the motor **80** rotates and the lever **117** gets out of contact with the cam surface of the cam **94***a*, the rotation of the lever **117** is restricted by the inner surface of the cover member **30** (see FIG. **41**). Further, the inner surface of the cover member **30** also restricts the lever **117** in a thrust direction to the left.

The cam **94***a* of the ejection unit **72** on the left hand side is seen to have rotated by 45 degrees in the direction indicated by the arrow J, compared with the position of a cam **125***a* of the ejection unit **73** on the right hand side. Further, the lever **117** of the ejection unit **72** on the left hand side is seen to have rotated by 5 degrees in a direction indicated by an arrow M, compared with the position of a lever **118** of the ejection unit **73** on the right hand side, such that the projection **117***a* is in such a position that the projection **117***a* is visible through the failure indicator hole **115**. Therefore, as in the first embodiment, when one of the removable hard disks **3** fails, the CPU**110** of the personal computer **1** detects the failure and causes the cam of the ejection unit corresponding to the failed removable hard disk **3** to rotate by 45 degrees so as to position the projection at the corresponding failure indicator hole to thereby indicate the failure.

While in the embodiments described above, a plurality (two in the above embodiments) of electronic devices of the same type (for example, removable hard disks) are removably attached to the disk unit **5** of the personal computer **1**, the present invention is not limited to these embodiments. The present invention may be also applied to a case where a plurality of electronic devices of different types such as CD-ROM and a TV tuner that are removably attached to the disk unit **5**.

While in the embodiments described above, the information processing apparatus implemented by a personal computer, the present embodiment is not limited to an information processing apparatus for a specific application and may be also applied information processing apparatuses for various applications, such as a workstation.

What is claimed is:

1. An electronic apparatus comprising:

a main body;

a receiving unit that is removably attached to said main body and receives at least one removable electronic device removably attached thereto to permit the removable electronic device to be selectively ejected from the receiving unit;

a locking device that locks together said receiving unit and said main body; and

a controller that controls said locking device to inhibit said receiving unit and said main body from being released from a state in which they are locked together while the removable electronic device is in operation.

2. An electronic apparatus as claimed in claim **1**, comprising an electronic device removing device that removes the removable electronic device from said receiving unit, and wherein said controller controls said electronic device removing device to inhibit the removable electronic device from being removed from said receiving unit while the removable electronic device is in operation.

3. An electronic apparatus as claimed in claim **1**, comprising a connector unit provided in said main body, and wherein said receiving unit is removably attached to said connector unit, said locking device locks together said receiving unit and said connector unit, and said controller controls said locking device to inhibit said receiving unit from being removed from said connector unit together while the removable electronic device is in operation.

4. An electronic apparatus as claimed in claim **3**, wherein said receiving unit has formed therein at least one recess at such a location that the recess is hidden inside said main body when said receiving unit is attached to said connector unit, and is exposed externally when said receiving unit is removed from said connector unit.

5. An electronic apparatus as claimed in claim **3**, wherein said locking device comprises a locking mechanism that locks together said connector unit and said receiving unit when said receiving unit is attached to said connector unit, said locking mechanism being responsive to a lock release command from said controller, for releasing locking of said connector unit and said receiving unit.

6. An electronic apparatus as claimed in claim **3**, comprising a unit removing device that is responsive to a removal command from said controller, for removing said receiving unit from said connector unit, when said receiving unit is attached to said connector unit.

7. An electronic apparatus as claimed in claim **6**, wherein said controller controls said unit removing device to inhibit said receiving unit from being removed from said connector unit while the removable electronic device is operation.

8. An electronic apparatus as claimed in claim **7**, comprising a single driver that drives said locking device and said unit removing device.

9. An electronic apparatus as claimed in claim 3, wherein the removable electronic device is configured such that the removable electronic device can be removed from said receiving unit when said receiving unit is removed from said connector unit.

10. An electronic apparatus as claimed in claim 3, wherein the removable electronic device comprises a plurality of removable electronic devices of a same type or of different types.

11. An electronic apparatus as claimed in claim 10, comprising a plurality of electronic device removing devices that are provided in association with respective ones of the plurality of removable electronic devices, for removing the respective removable electronic devices from said receiving unit, and wherein said controller controls any of the removable electronic device removing devices to enable a corresponding one of the removable electronic devices that is not in operation to be removed from said receiving unit.

12. An electronic apparatus as claimed in claim 10, comprising a display device that displays an indication as to which of the plurality of removable electronic devices attached to said receiving unit has failed in a case where any of the removable electronic devices fails, and said display device continues displaying the indication even after said receiving unit is removed from said connector unit.

13. An electronic apparatus as claimed in claim 12, comprising a plurality of electronic device removing devices that are provided in association with respective ones of the plurality of removable electronic devices, for removing the respective removable electronic devices from said receiving unit, and wherein said controller issues a removal command to any of the removable electronic device removing device corresponding to any of the removable electronic devices that has failed, for removing the failed removable electronic device from said receiving unit.

14. An electronic apparatus as claimed in claim 13, comprising a single driver that drives said removable electronic device removing devices and said display device.

15. An electronic apparatus as claimed in claim 3, wherein said removable electronic device is positioned such that outer surfaces thereof lie inwardly of an outer surface of said receiving unit on a side thereof at which the removable electronic devices are attached to said receiving unit.

16. An information processing apparatus comprising:

an electronic apparatus comprising:

a main body;

a receiving unit that is removably attached to said main body and receives at least one removable electronic device removably attached thereto to permit the removable electronic device to be selectively ejected from the receiving unit;

a locking device that locks together said receiving unit and said main body; and

a controller that controls said locking device to inhibit said receiving unit and said main body from being released from a state in which they are locked together while the removable electronic device is in operation.

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